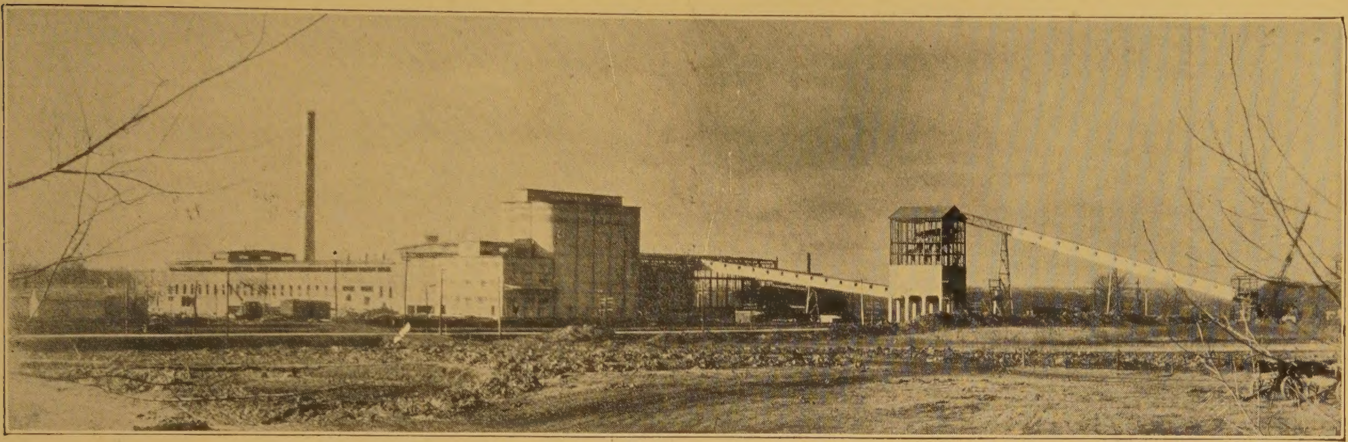
MILL SECTION of
Concrete



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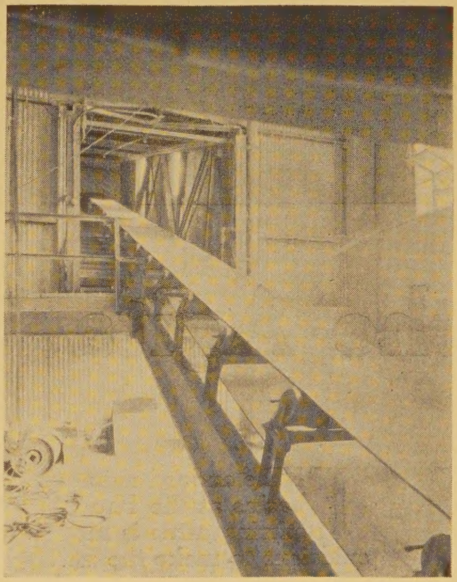

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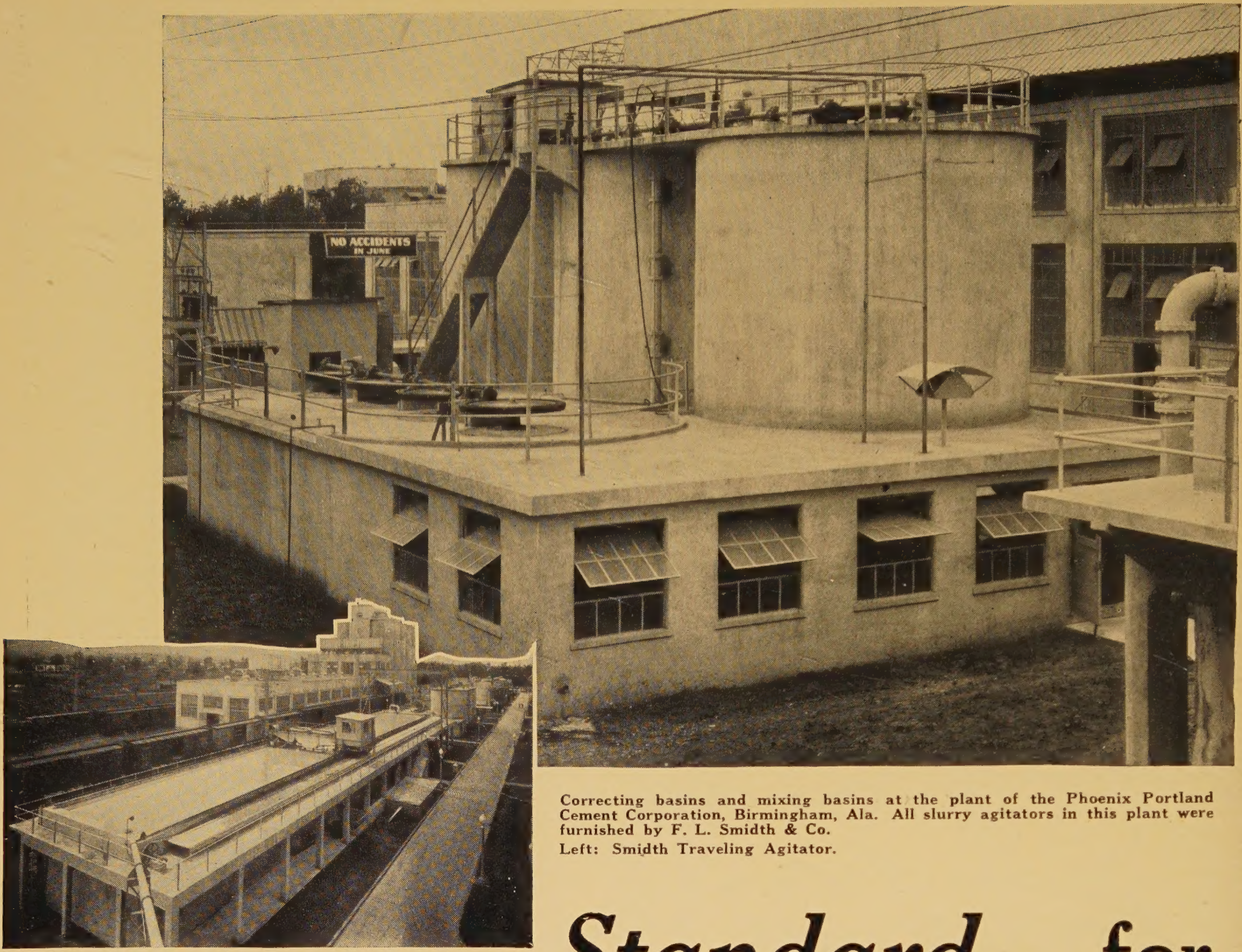
Index to Advertisers on Page 91 of This Section



Correcting basins and mixing basins at the plant of the Phoenix Portland Cement Corporation, Birmingham, Ala. All slurry agitators in this plant were furnished by F. L. Smidth & Co.
Left: Smidth Traveling Agitator.

Standard... for the Agitation of Cement Slurry

THE standard agitators furnished by F. L. Smith & Co., Inc., New York, for the several basins at the Phoenix plant, combine mechanical agitation with air. On each of the stirring arms is mounted an air nozzle through which is supplied a quantity of air just sufficient to make the vertical mix. The stirring arms mechanically make the horizontal mix.

The photograph above shows the three correcting basins, each 20 ft. in diameter and 20 ft. high, and the mixing basin which has a capacity equal to all three correcting basins.

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ENGINEERS
Designers and Equippers of
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Index to Advertisers on Page 91 of This Section

MILL SECTION of
Concrete

The Mill Edition of CONCRETE is edited for the manufacturers of portland cement, lime and similar products. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition.

The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

Volume 31 November, 1927 Number 5

CONTENTS

□ □ □

Valley Forge Cement Co. Builds Plant in Philadelphia's Back Yard 93

The hilly site on which the plant was located and the use of Polysius equipment make this description of the new plant of the Valley Forge Cement Co. at West Conshohocken of especial interest to cement manufacturers.

Synchronous Motor Control 98

J. H. Hall discusses automatic control of synchronous motors in cement plants.

Florida Portland Cement Co. Begins Operations 101

Part II of the description of this plant emphasizes some of the special equipment used in building this plant at Tampa and discusses the effect of this equipment on operating conditions.

Cement Making from Waste Materials 105

In these days when location close to large markets is of primary importance for cement plants, a wider variety of raw materials must be considered. In this article E. T. Ellis, F. J. I., discusses the probable use of some by-products and industrial wastes that could be utilized as raw materials in cement manufacture.

Editorials 107

Colored Cements
Mechanical Progress

Men and Mills 108

What's going on in the cement industry everywhere. Four pages of news about cement plants and the men who operate them.

Cement Statistics for September 112

With the Manufacturers 113

New Mill Equipment 114-116

REGULAR SECTION

The Future of Reinforced Concrete 36

Part II of Mr. McMillan's analysis of the future of the reinforced concrete industry and its present problems.

Relation Between the Characteristics of Portland Cement and Deterioration of Concrete 46

In this, the last article in this series, John R. Baylis gives some suggestions for improving the durability of concrete that are of interest to cement plant chemists and executives.

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INDEX TO ADVERTISEMENTS

Allis-Chalmers Mfg. Co. 119
Babcock & Wilcox Co. 120
Baker & Spencer, Inc. 134
Bates Valve Bag Co. 131
Black, Henry 78
Bradley Pulverizer Co. 133
Burrell Engineering & Const. Co. 137
Caldwell, H. W., & Son 125
Cutler Hammer Mfg. Co., The 118
Edge Moor Iron Co. 128
Engineering & Designing 134
Fuller Co., The 129
Goodyear Tire & Rubber Co., Inc., The 124
Heine Boiler Co. 127
Hunt, Robert W., Co. 86
Huron Industries, Inc. 117
James Mfg. Co., D. O. 115
Jones Foundry & Machine Co., W. A. 123
Jeffrey Mfg. Co., The 138
Keystone Driller Co. 135
Kritzer Co., The 134
Latimer, Robert, & Co. 136
Link-Belt Co. 126
Manitowoc Eng. Works 130
Meade, Richard K., & Co. 134
Pennsylvania Crusher Co. 135
Polysius Corp. 92
Quigley Furnace Specialties Co., Inc. 121
Sargent, E. H., & Co. 133
Schaffer Poidometer Co. 137
Smidth, F. L., Co. 90
Sonntag, C. H. 134
Standard Oil Co. 122
Super Cement Co., The 88
Timken Roller Bearing Co., The Front Cover
Webster Mfg. Co. 89
Wood's, T. B., Sons Co. 136

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MILL SECTION of

Concrete

Vol. 31 Chicago, November, 1927 No. 5

Valley Forge Cement Co. Builds Plant in Philadelphia's Back Yard

New Plant of the Valley Forge Cement Company Located on Highway and Railway Transportation at West Conshohocken, Pa., near Philadelphia—Location of the Plant Buildings on Various Levels Made Interesting Conveying Problem—Solo Type Kilns Installed

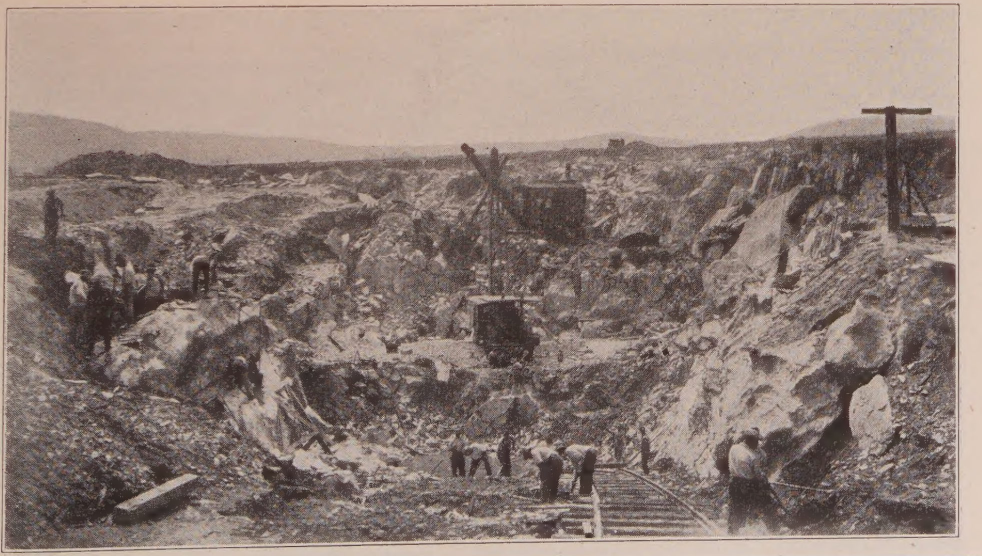
WHEN, on January 9, 1927, ground was broken at West Conshohocken, Pa., another mill was added to the growing list of plants located in or near large cities. The Valley Forge Plant is located on the main highway leading into Philadelphia, bringing that and tributary markets within easy truck hauling distance. In addition to the highway facilities, the new plant is served by the Reading Railroad and by the Pennsylvania Railroad through Upper Merion and Plymouth Railroad connections.

A Difficult Location

An interesting problem in transporting materials was introduced by the hilly character of the site on which the plant was located. The locations of the highways and the railroads fixed the locations of the packing house, the coal mill, the storehouse and gypsum tracks at points where they would be most efficiently placed to receive materials and ship finished cement. To prepare such a location, it was necessary to enlarge two small quarries, moxing approximately 120,000 cubic yards of ground.

The crusher house, kiln rooms and slurry tanks were placed on a high track of ground with the packing house, coal mill and silos on the low ground on one side where they could be reached by the highway and the railway, and locating the machine shop, substation, mill building and storage building on the low ground on the other side.

Because of the flexibility of the Fuller-Kinyon system for transporting the materials, this arrangement was found to be entirely practical. The layout made it necessary to pump the slurry a distance of approximately 400 feet against a head of 95 feet to the slurry tanks at one side of the kiln building. Finished cement is pumped a distance of 770 feet from the mill building to the silos. It is this flexibility of handling materials, also, that made it possible to locate the pack house so favorably between the main highway and the Pennsylvania Railroad and to permit the tracks of the Upper Merion and Plymouth



The quarry, the crusher house and the kiln rooms are located on high ground

The gypsum elevator and storage bin

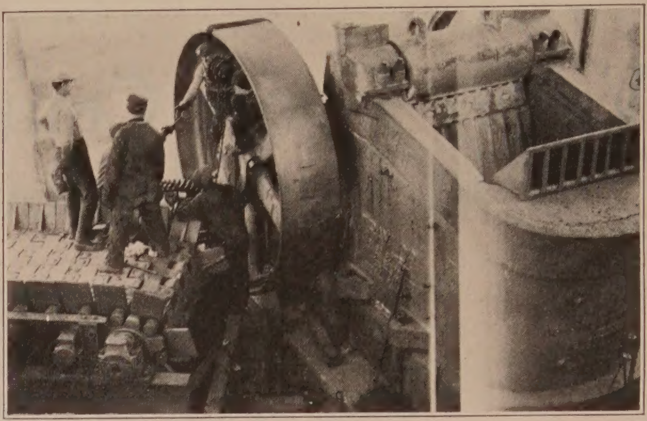
Railroads to pass through the pack house.

Raw Materials and Storage

The plant location is underlain with a vast supply of limestone which is within two or three per cent of the proper mix for cement manufacture.

The quarry is located approximately 1000 feet from the crusher house which is at the same elevation as the materials building and the kiln room. Rock is drilled with a Loomis clipper drill. Secondary drilling is done with jack hammers. Rock is loaded into 8-yard Easton dump cars by a No. 37 Marion electric shovel equipped with Ward-Leonard control. Twelve-ton locomotives, manufactured by the Vulcan Iron Works, haul the rock trains from the quarry to the crusher house. An air hoist dumps the rock from the cars into a Traylor apron feeder which feeds the crusher. Primary crushing is done in a 48- by 60-inch Traylor jaw crusher. A No. 9 Williams Hammer mill reduces the rock to the tube mill size and delivers it onto a distributing belt which conveys it to storage. The crusher house is kept free from dust by means of a Norblo System manufactured and installed by the Northern Blower Company.

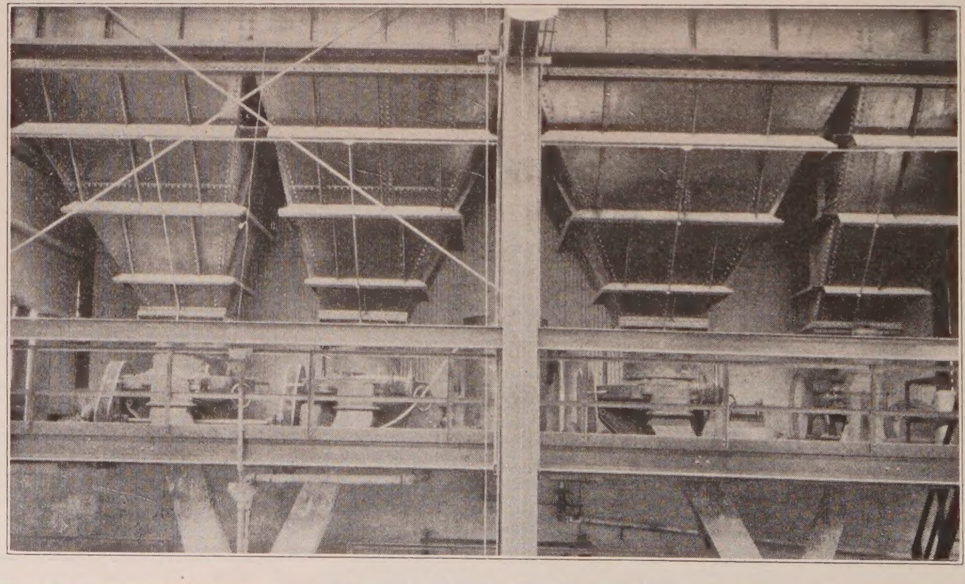
The storage building is located at right angles to the kilns and a little below the kiln room level. It is 242 feet long and 80 feet wide, providing storage for rock, clinker and gypsum. An 8-ton Harnischfeger electric crane, equipped with a 3-yard Blaw-Knox bucket, handles the materials in storage. A month's supply of stone can be carried in storage. Rock, clinker and gypsum supply bins, of sufficient capacity for one shift operation, extend into the storage building to facilitate charging.



Installing the Traylor crusher and feeder

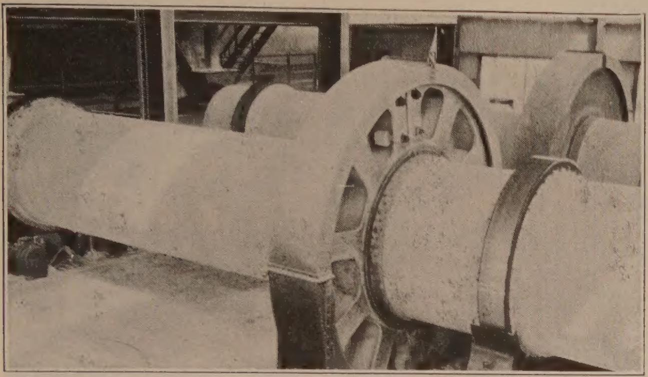
Solo Mills and Kilns Installed

The principal equipment in the grinding and kiln departments is of the Solo type, supplied by the Polysius Corporation of Bethlehem, Pa. Raw and finish mills are of the three-compartment type, 7 ft. 3 in. in diameter and 42 ft. 8 in. long. Two table feeders, one for high and one for low rock, feed the raw mill. The finish mill is similarly served, one feeder being for clinker and the other for gypsum. The feeders discharge through automatic scales which measure and record the weight of the mate-



The storage bins and the rock and clinker feeding table in the milling department rials supplied and permit accurate chemical control. Two 3-inch Wilfley slurry pumps and one 6-inch Fuller-Kinyon pump are installed in the pump pit to convey the materials discharging from the raw and finish grinding mills.

There are two kilns and these, also, are of the Solo type, supplied by the Polysius Corporation. The kilns are 223 feet 1½ in. long and are carried on 6 sets of rollers. They consist of a double cooling section, 9 ft. 10 in. in diameter and 31 ft. long, an enlarged burning zone 11 ft. 10 in. diameter and 50 ft. long and a rear section 8 ft. 10 in. in diameter by 142 ft. long. Draft, temperature and gas analysis instruments as well as the control of coal, kiln and slurry feed are placed on the burning platform and permit accurate control of the burning process.

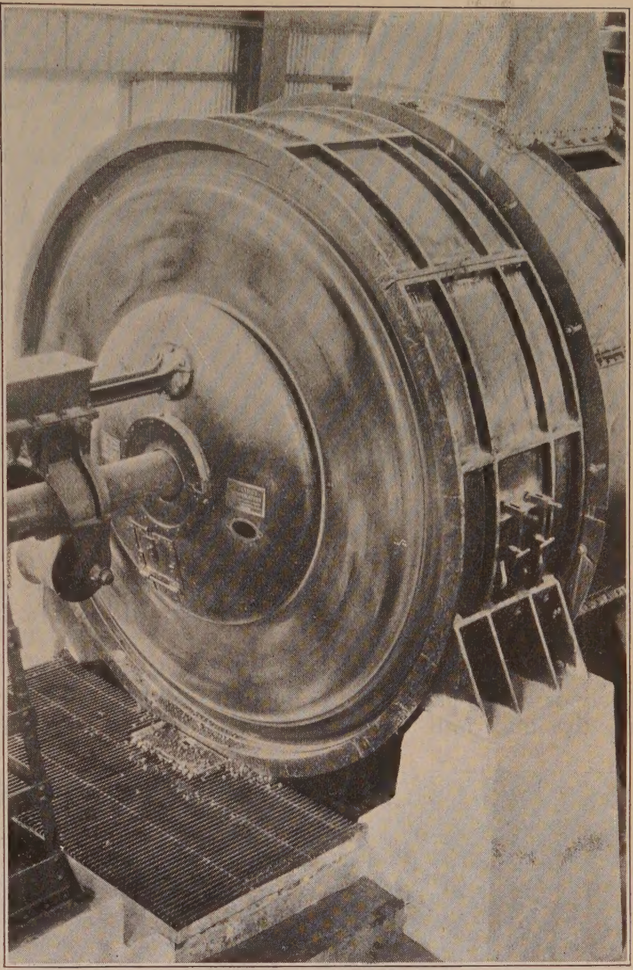

The Polysius tube mills

The kilns are fed by revolving Polysius feeders which can be regulated by a variable speed motor or by changing the float level in the feed basin. A concrete chimney, 13 ft. inside diameter and 307 ft. high, built by the Rust Engineering Co., serves the two kilns.

Slurry Handling

The slurry tanks are located just to one side of the kiln building. There are 10 of them, providing storage for 8000 barrels of slurry. Each tank is 22 ft. in diameter by 24 ft. deep. Dorr combination mechanical and air agitators are used.

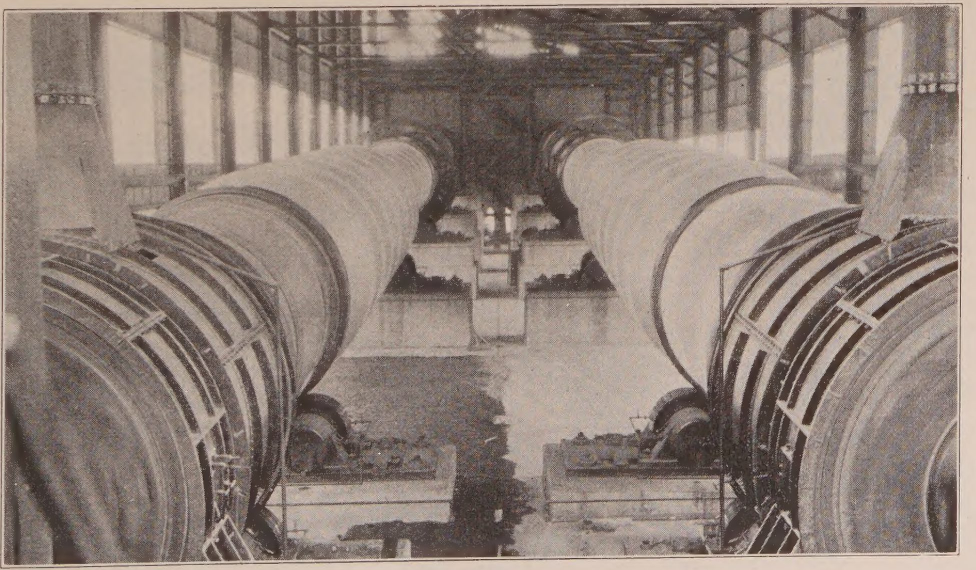
Slurry pumping equipment consists of three 4-inch Wilfley slurry tanks. The installation is arranged to provide flexibility. Any pump can be used either to feed the kilns or to convey slurry from any one of the tanks to any other. The slurry lines are equipped with Nordstrom slurry valves.

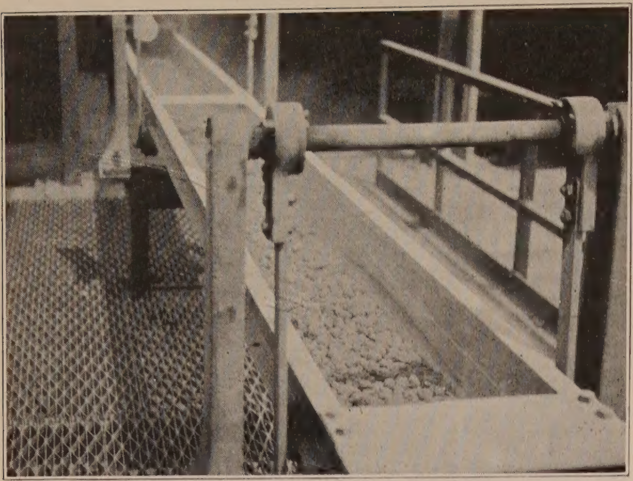

The discharge head of the Polysius solo kiln

From the tanks the slurry is pumped to a kiln feed tank which keeps a constant head on the slurry feeder and delivers to the kilns as previously described.

Handling Clinker and Cement

Clinker discharges from the cooling section of the kiln through an automatically controlled valve into an F. L.

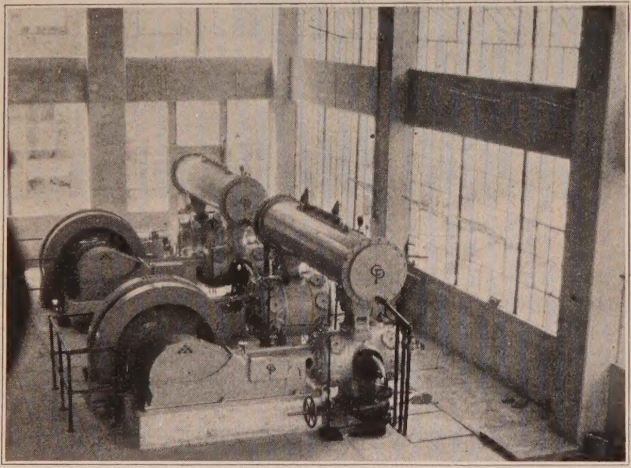

A view of the two Solo kilns, taken from the burning platform



The Skipulter conveyor which delivers the clinker from the kilns to the continuous scales

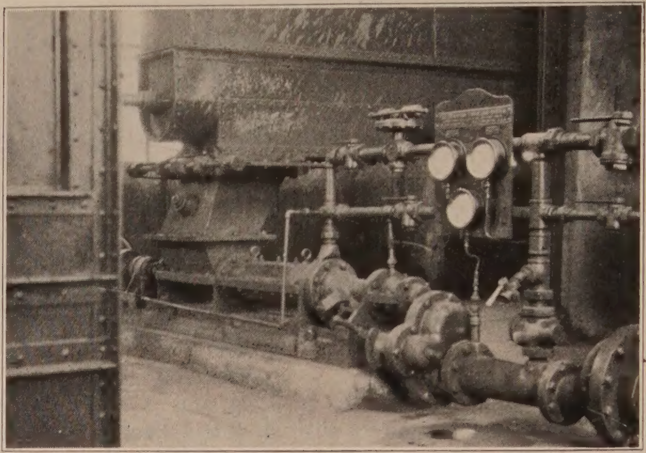
Smidth Skipulter conveyor. From here the clinker is delivered into a Richardson continuous scale before it discharges into storage.

Clinker is reclaimed from storage by the crane previously described and placed in the mill feed hopper. Leaving the finish mill, the cement is conveyed by a Fuller-Kinyon pump to the silos. The silos, which have a capacity of about 130,000 barrels of cement, consist of one 50 ft. diameter bin, 7 interstice bins and eight 20 ft. diameter bins. Under the silos are 3 tunnels in each of which is a portable Fuller-Kinyon pump which transports the cement to the pack house.



Air compressors in the substation

Because a considerable proportion of the cement produced will be hauled by truck to the nearby cities, the pack house is equipped for handling both highway and rail shipments. The car loading bay is served by two 4-spout Bates packers, while the truck loading bay is served by three machines of the same type.



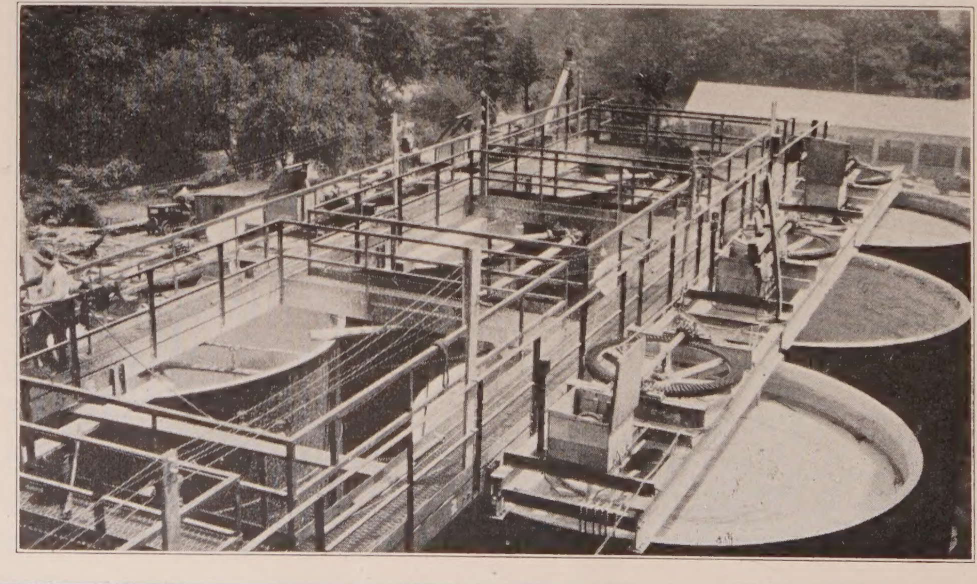
Fuller-Kinyon pump which transports the pulverized coal to the kilns—a distance of 727 feet, including a 104-foot lift

The dust collecting system in the pack house was also installed by the Northern Blower Company. Bag handling and cleaning equipment was installed by the Modern Valve Bag Company.

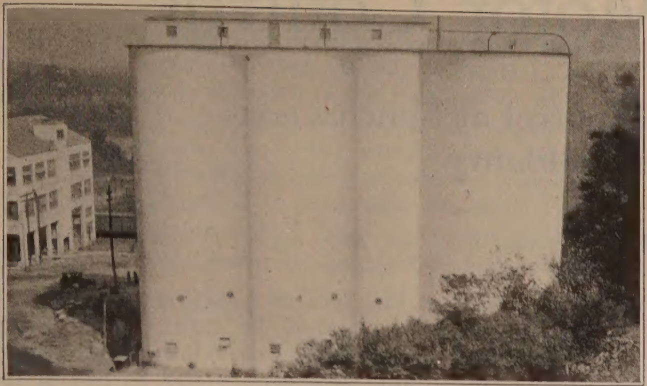
Other Departments

All the equipment in the coal department was supplied by the Fuller-Lehigh Company. It consists of one 5 ft. 6 in. by 42 ft. indirect feed rotary dryer and two 48 inch gear driven, screen type Fuller mills. A Fuller-Kinyon system transports the powdered coal a distance of about 727 feet, which includes a 104 lift, from the coal mills to the bins at the kilns.

The Counties Gas & Electric Co. supplies all the power



The slurry tanks and Dorr agitators



The storage silos, showing the cement line entering the monitor

used in the mill. Power is delivered at 33,000 volts. At the transformers it is stepped down to 2300 volts and delivered to the switchboard. Transformer and switchboard equipment was furnished by the Westinghouse Electric and Manufacturing Co.

Other equipment in the power house includes two Chicago Pneumatic Tool Company air compressors equipped with after coolers and receivers, two General Electric motor generator sets of 150 K. W. capacity.

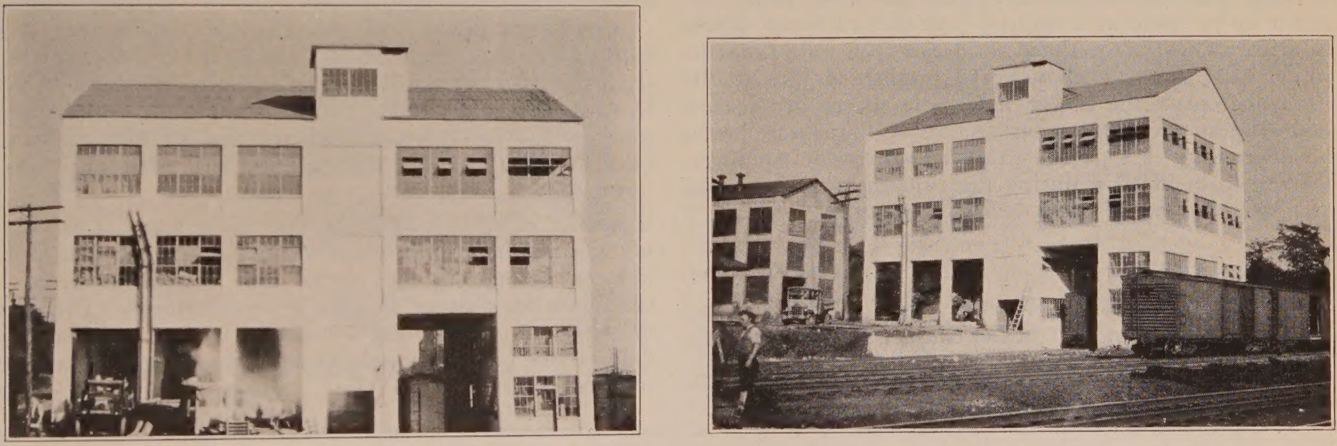
All motors in the plant were furnished by the General Electric Co. All speed reducers were furnished by the Duval Steam Turbine Co. of Trenton, N. J.

Evidencing their faith in the material they are going to produce, the builders of the plant chose reinforced concrete as the principal construction material. Red cement asbestos roofing adds a touch of color to the site, which with its green hills, light colored buildings and the tall, white chimney present an attractive appearance to the motorist passing the plant. The buildings, which are to be extended as the plant is enlarged, are covered with grey cement asbestos siding. All of the concrete construction was done by the MacDonald Engineering Co. of Chicago.

Only half a year elapsed from the time ground was broken on January 9, 1927, till the day the first shipment of cement left the mill on July 30, 1927. The production capacity of the plant as now installed is approximately 2300 barrels per day. Plans are made to increase this to 3000 barrels in the near future.

Officers of the Valley Forge Cement Co. are: Col. J. W. Fuller, president; C. H. Breerwood, vice president and general manager; R. S. Weaver, secretary and treasurer; F. A. Weibel, assistant treasurer; R. F. Weston, general superintendent; C. H. Moore, superintendent of construction and W. H. Andrews, supervising chemist.

The design and construction of the plant was under the supervision of A. E. Douglass.



Two views of the pack house, showing the facilities for both truck and car loading. The illustration on the left shows the Fuller-Kinyon transport lines from the portable silo pumps

Satisfactory Cement Trade Shown in Survey by Manufacturers' Body

From the National Association of Manufacturers, which met recently at Chattanooga, Tennessee, comes the following survey of past and future conditions in the cement industry:

Present trade in cement is reported favorable without exception, 15 per cent stating it excellent, 46 per cent reporting it good and 39 per cent fair. Prospects for winter trade are reported good and fair by 42 per cent and 50 per cent, respectively, with 8 per cent viewing them as poor.

Better trade than last fall is reported by 33 per cent, unchanged conditions by 17 per cent, and lower by 50 per cent. Stocks on hand are reported low by 25 per cent, normal by 50 per cent, and over by 25 per cent.

A small increase in employment as compared with last fall is reported by 33 per cent, with 50 per cent reporting a small decrease. No shortage in skilled labor is reported by 91 per cent, with 100 per cent reporting none in unskilled labor. A small increase in wages is reported by 50 per cent, and a small decrease by 8 per cent.

Greater production than last fall is reported by 50 per cent, and less by 16 per cent, with an increase in sales quantities reported by 50 per cent and a decrease by 41 per cent.

Sales values are reported higher than last fall by 16 per cent of those reporting, and lower, by 68 per cent. There are no strikes in the industry, 16 per cent reporting them eliminated.

Synchronous Motor Control

A Discussion of Automatic Control of Synchronous Motors in Cement Plants

By J. H. HALL*

A SYNCHRONOUS motor, unlike a squirrel-cage, or a slipring induction motor, has a direct current field winding and the control in starting therefore involves one more operation—that of exciting the field winding at the proper time. It is common practice to connect the field winding during starting in a closed circuit including a resistance known as the field discharge resistance. This circuit is closed when the field is disconnected from the D. C. line, when the motor is stopped to allow the field to discharge, thereby preventing undue voltage strains on the insulation of the field circuit. Starting with a closed field circuit also reduces the voltage strains which would otherwise be induced at the field terminals. The closed field circuit during starting also performs an important function in the modification of starting torque, which will be referred to later.

The self-starting synchronous motor has an amortisseur, or cage winding on the field pole pieces to bring the motor up to speed as a squirrel-cage motor. Some makes of synchronous motors have solid cast iron pole shoes in which eddy currents circulate to produce a like result. At synchronism the motor field pole pieces are locked opposite the revolving polar section of the stator, hence no alternating flux passes through amortisseur windings, leaving them inactive during the running period, except as a damping device for reducing hunting.

Starting Torque

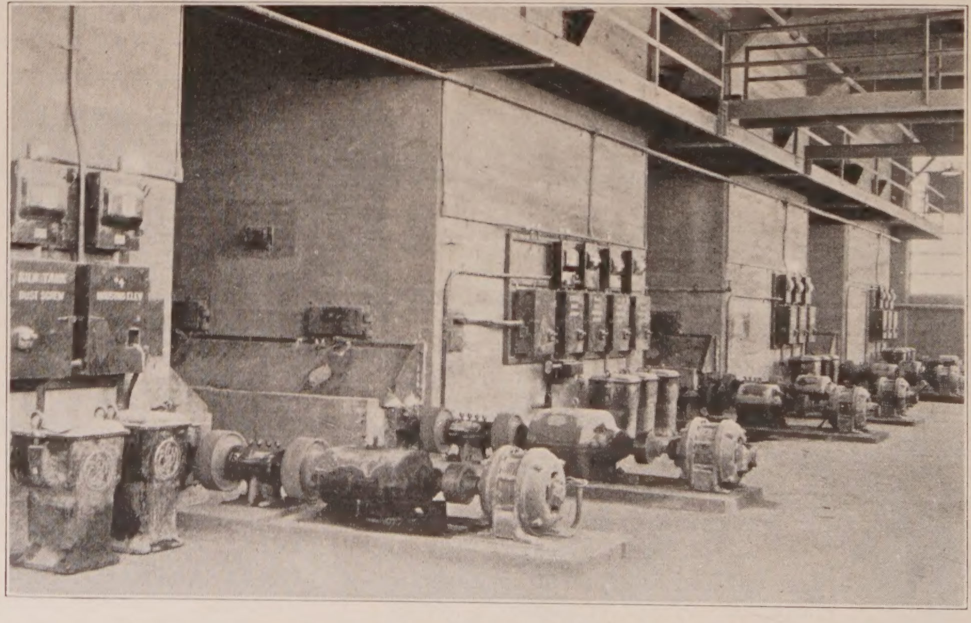
The starting torque developed by the cage winding can be made high or low to suit the character of the load by the use of a high or low resistance cage winding. There is this difficulty, however, that the cage winding which gives a high starting torque will have a low pull-in torque. If a high pull-in torque is desired it can be had at the expense of a low starting torque.

The torque developed by the closed field winding during starting depends to a certain extent upon the value of resistance included in the circuit and can therefore be modified by changing the value of the field discharge resistor. The torque due to the influence of the field circuit has the characteristic of opposing the torque developed by the cage winding from zero to half-speed and assisting it from half-speed to nearly synchronous speed. The two windings can therefore be designed so that their combined torque is high both at starting and at pull-in. The combined starting torque is effective up to approximately 95 per cent synchronous speed when it begins to decrease rapidly to zero at synchronism.

A motor without load will sometimes lock into step without the D. C. field being energized but a motor even slightly loaded, requires the connection of the field to the D. C. supply to pull the motor into step. This should take place at the speed nearest synchronism so that the combined starting torque will operate the connected load.

The current induced in the closed field circuit has a frequency equal to that of the line at the moment of starting and gradually diminishes to zero at synchronism. The induced voltage in the circuit also diminishes from a maximum at starting to zero at synchronism. This has the effect of maintaining a constant current value in the field circuit until very near synchronism when the current reduces to zero.

Automatic compensators in an exhaust fan room



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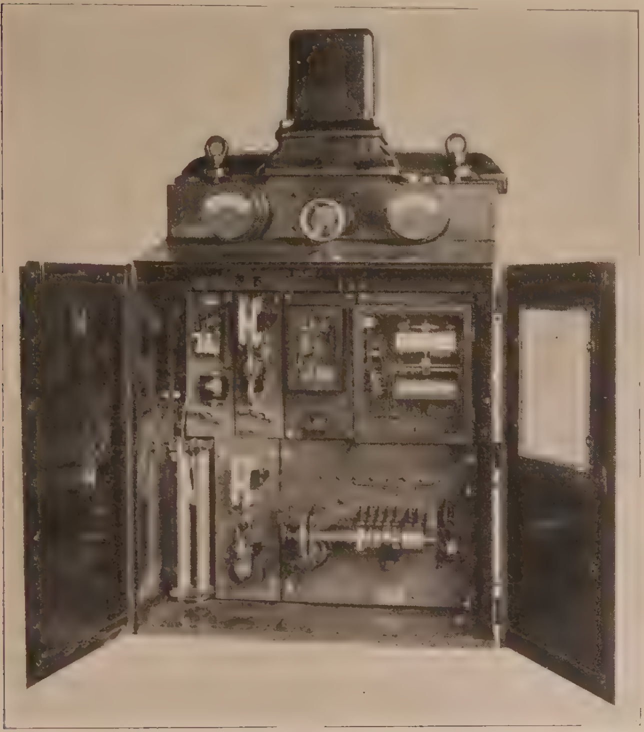
*The Electric Controller and Manufacturing Co., Cleveland, Ohio.

The Field Switch

The field switch in operating opens the closed field circuit and connects the field winding to the D. C. supply. A field rheostat is included in the field circuit when connected to the D. C. supply to permit the adjustment of the field excitation to give the desired power factor correction. The following devices are used for automatically closing the field switch at the proper moment:

(1) *Time Relay:* This relay allows a sufficient time to elapse after the stator is connected to full voltage, for the motor to accelerate to its maximum speed, at which time it operates to close the field contactor.



A 350-hp., 2300-volt synchronous motor starter with self-contained field switching panel, magnetic clutch control and wattmeter

(2) *A Field Contactor* having two opposing windings, (a) a shunt winding connected to the line tending to close it and (b) a winding in the closed field circuit tending to hold it open. This contactor operates when the field current diminishes to a low value and connects the field to the D. C. line.

(3) *Frequency Relay:* The winding of this is in shunt with a reactor connected in the closed field circuit. As a result of the high frequency of the induced field current at the beginning of the starting period, a greater portion of the current flows in the shunt path containing the relay winding, and its contacts are held open. The relay winding is energized until the frequency reduces to a low value near synchronism, at which time its contacts close and energize the operating coil of the field contactor.

Starting Equipment

Synchronous motor starting equipment involves the A. C. switching apparatus for the stator, the D. C. switching apparatus for the field and usually a number of indicating or recording instruments of various combinations for both circuits. In order to make use of standard equipment, the practice in the past has led to the use of the switchboard type of control apparatus, which requires considerable space and a location free from dust.

In cement mills, and other plants where fine dust is prevalent in the atmosphere, it is difficult to keep the dust out of separate control rooms or even from a separate building sometimes erected to house the control equipment.

To meet these conditions which are practically the same, except as to degree, as those existing in the mill, a unit type self-contained form of starting equipment has been developed. The apparatus is entirely enclosed and can be mounted near the motor for individual installation, or in a control room for a group of motors. The entire equipment comprises a single piece of apparatus arranged for floor mounting thoroughly protected again moisture and dust. The A. C. equipment, including the contactor mechanism, transformers, relays, etc., is contained in a steel tank and completely submerged in oil. The tank has a cast iron cover, with the O. L. relays mounted above the oil and enclosed by an auxiliary cover.

The D. C. field switching apparatus is enclosed in a dust-proof compartment, forming an integral part of the unit, with provision for mounting indicating, integrating, or recording instruments as desired. For small motors the field rheostat can be mounted self-contained. For the larger motors, the field rheostat is of such large dimensions that it is mounted separately but can be adjusted by a rheostat handle conveniently mounted on the unit type starting equipment.

Methods of Control

The following equipment is provided for the control of synchronous motors.

Reduced Voltage Starting: Since the starting of a synchronous motor is similar to that of a squirrel-cage motor, a standard automatic compensator is used to connect the stator to the A. C. lines, with an automatic transformer to provide the reduced voltage at starting. The compensator operates with current limit acceleration to connect the motor to full voltage at about 75 per cent of the synchronous speed of the motor. On high-voltage compensators the continuous torque method of transition is used in which the motor is not disconnected from the line during the switching operation. The automatic field switching device electrically interlocked with the compensator, operates to open the closed field circuit and connect the field to the D. C. supply at about 95 per cent of synchronous speed. The D. C. excitation of the field effects the final step of pulling the motor into synchronism. The entire operation takes place automatically and is controlled from a single start and stop master switch.

Primary resistor type of reduced voltage starting is sometimes substituted for the compensator type, the automatic operation being otherwise the same.

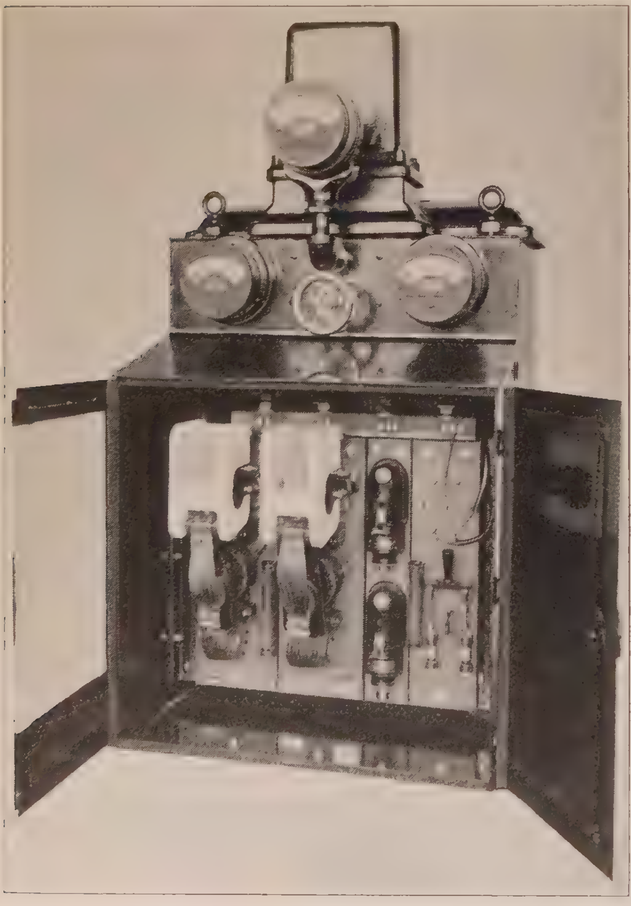
Slow speed synchronous motors as compared with high speed synchronous motors or squirrel-cage motors have a low current inrush if started on full voltage. Where the conditions are such as to permit it, slow speed synchronous motors are started across the line. In this case the compensator is replaced by an across-the-line starter in connection with the field switching device and the necessary electrical interlocks.

Special Features

Clutch Control: When crushers and grinders requiring a heavy starting torque are driven by synchronous motors it is the custom to provide a magnetic clutch between the motor shaft and the driven shaft. This allows the motor to be started light, requiring a small amount of power during the starting period. The load shaft is then started by energizing the clutch, the motor then being available for starting the load to its maximum pull-out torque. The use of a clutch also permits the load to be stopped without stopping the motor, the motor continuing to run as a synchronous condenser for power factor correction. Synchronous starters can have incorporated in the self-contained unit a clutch controller, interlocked with the starting equipment, so that the clutch cannot be energized until the motor is up to speed and its field energized.

For small motors operating with a clutch, a single contactor controlled by a separate push button can be used for energizing the clutch. For the larger motors, a resistor is inserted in series with the clutch and cut out by means of a time limit device or a motor-driven drum controller for gradually increasing the energization of the clutch. This has the effect of introducing a time element for bringing the load shaft up to speed, thereby keeping the motor current at a lower average value during the starting of the load itself.

Feed Motor Control: On the Bradley-Hercules mills which are furnished with synchronous motor drive, a small squirrel-cage motor operates a device for regulating the feed of the material entering the crusher. Material is fed to the crusher only while the feed motor driving that device is running. A special current relay equivalent to a contacting ammeter controls the starting and stopping of the feed motor to maintain a constant load on the crusher motor in exactly the same manner as a pressure regulator controls a pump motor to maintain a constant pressure in a pressure system. The load on the synchronous motor is thus kept at approximately full load, the feed motor stopping when the load on the crusher motor is about 3 per cent above normal and starting again when the load has diminished to about 3 per cent below normal. The feed motor control is interlocked with the clutch control so that the clutch must be fully energized before the feed motor can start. On E. C. & M. equipment the feed motor regulator panel can also be enclosed in the compartment containing the field switching device.



A 75-hp. starter and self-contained D. C. generator panel for a motor-generator set that supplies direct current power to a group of synchronous motors

Protective Devices

No-Voltage Protection: The control circuits are arranged so that the motor must be restarted from the master switch after failure of A. C. voltage or overload.

D. C. Voltage Failure Relay: In systems using a separate D. C. source for the field, a relay is used with its winding connected across the D. C. lines and its contacts connected in series with the operating coil of the compensator or the across-the-line contactor, if used. This prevents the operator from attempting to start the motor unless the D. C. supply is available.

Overload Device: The overload relay coils are in circuit during the starting and running period. They are adjusted to operate on 125 per cent of full load to protect the motor during the running period, and they have sufficient time element to allow the motor to accelerate with the higher current value during starting. The magnetic circuit is so designed that for a given current in the coil, a constant pull exists between the movable and stationary portions throughout the whole travel of the relay plunger. If the plunger is partially raised due to a short time overload, it will reset to its full time position again when the overload condition is removed.

With the standard setting, the overload device will operate to take the motor off the line under the following conditions.

(1) Continued load above 125 per cent of normal.
(2) Heavy loads of less duration.
(3) An attempt to start with one phase open.
(4) Continued running with one phase open if the motor current in the remaining phases is above 125 per cent of normal.
(5) Upon the failure of the motor to accelerate in a given time.
(6) Upon the failure of the motor to pull into step.
(7) If the motor drops out of step.
(8) Upon the loss of the D. C. field.

Production of Magnesite in 1926

The production of crude magnesite in the United States in 1926 was 133,500 short tons, valued at $1,200,830, according to statistics compiled by J. M. Hill, of the Bureau of Mines, Department of Commerce. Four operators at 5 mines in 4 counties in California produced 53,940 tons of crude magnesite, valued at $604,130; all of them reported only fair business due to foreign competition and lower prices on all products. All of the output in Washington was from the mines of the Northwest Magnesite Co., which operated 2 of its 6 furnaces at Chewelah, Stevens County, part of the year.

Magnesite Supply in the United States, 1921-1926,
Expressed as Crude Magnesite, in Short Tons

Year	Domestic	Imported	Total*
1921	47,904	65,569	113,473
1922	55,790	217,861	273,651
1923	147,250	151,092	298,342
1924	120,100	148,700	268,800
1925	120,660	142,283	262,943
1926	133,500	196,318	329,818

Sales of magnesite of domestic origin in 1926 were 1,540 tons crude, 18,580 tons of caustic calcined (a decrease of approximately 22 per cent as compared with 1925), and 42,540 tons of dead-burned (an increase of 46 per cent as compared with 1925), having a total value of $1,703,490.

Florida Portland Cement Company Begins Operation

Difficult Foundation Conditions Necessitated Compact Layout—New Type of Car Dump—Dorr Thickener Acts as Reclaiming Basin — Waste Heat Boilers — Power House—Electrical Equipment—Coal is Dried by Hot Gases Drawn Through Jackets on the Kilns

Part II.

THE construction of the plant of the Florida Portland Cement Company at Tampa, Florida, involved several technical engineering difficulties in order to carry out the proposal to locate this plant on tidewater.

Foundations

It was necessary, due to a lack of bearing power in the soil, to sink approximately twenty-one thousand wooden piles to a depth varying from 35 feet to 45 feet, where a foundation was secured on a coral rock formation. The driving of these piles in itself added considerable difficulty to the construction of the plant. As soon as the piles were sunk, in order to prevent deterioration, it was necessary to cut them two feet above mean low tide and cap them with concrete, forming the bed on which all buildings, docks, machine foundations, railway tracks, walkways, and platforms were to rest. Much of the plant site was covered by tidewater and men were forced to work up to their waists in mud and water. The dangers of dry rot and the terredo worm also played their part in increasing construction difficulties.

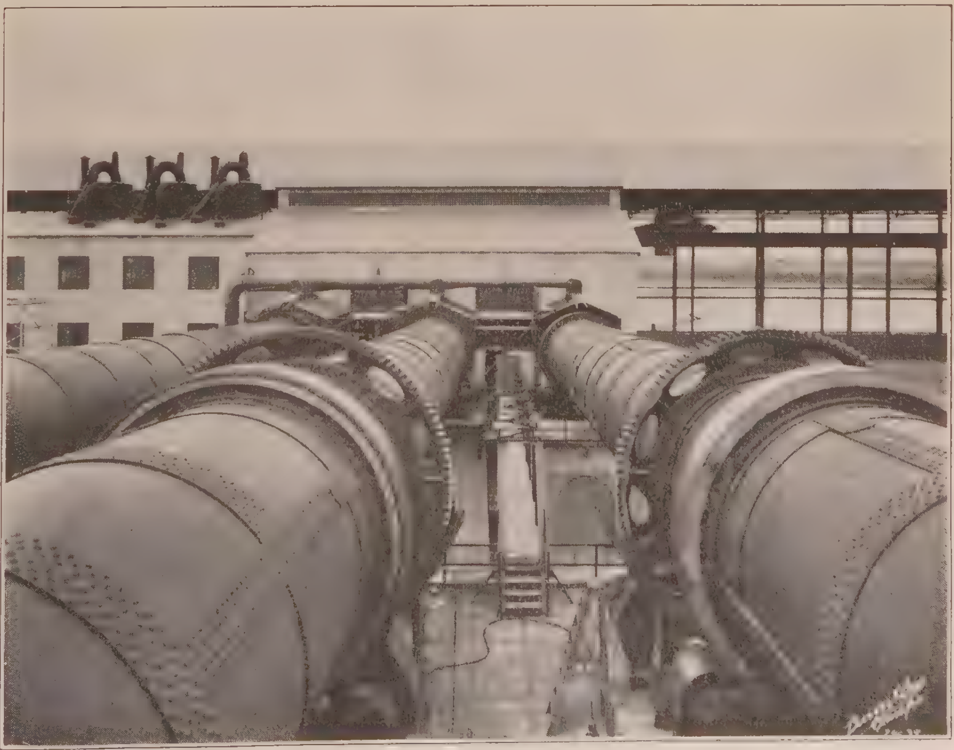
A concrete structure was extended six feet up from this capping, to which a second floor or working platform was laid. This construction required 29,315 cubic yards of concrete.

The above construction has all been completed and work is now started on filling the plant site to a level of 8 feet above mean low tide. This is being accomplished by a dredge working in the deep water of the bay. Due to the necessity of building a concrete bed for the plant, the entire layout was condensed as much as economical operating practice would allow, at the same time making provision for any increase in production capacity when such is warranted.

The burning capacity of the plant, as mentioned in the previous article, is 1,500,000 barrels per year, as determined by three 11 x 175 ft. kilns. However, the raw grind and finish grind departments are of sufficient capacity to handle 2,000,000 barrels per year, which will allow an increase in capacity merely by the installation of another kiln and cooler.

Every provision has been made regardless of construc-

There are three 11- by 175-ft. kilns. At the farther end of the kilns are shown the jackets which collect the heat from around the burning end of the kilns and deliver it at a temperature of 340 deg. for drying the coal



tion difficulties to make this plant an economical operating unit. In carrying out this policy, several novel features have been introduced, including such devices as the car dump, the Dorr thickener, evaporating plant, etc.

Car Dump

As was mentioned in the previous article, all of the raw materials are received by train from the raw material deposits fifty miles north of Tampa. These materials are shipped in standard gondola cars. To facilitate handling by the most economical means, a Wellman-Seaver-Morgan car dump was installed, dumping the entire contents of a car into a concrete pit, from which the material is removed by a locomotive crane to a hopper feeding direct to the preliminary crusher. This car dump works on the principle of a revolving unit and inclined plane.

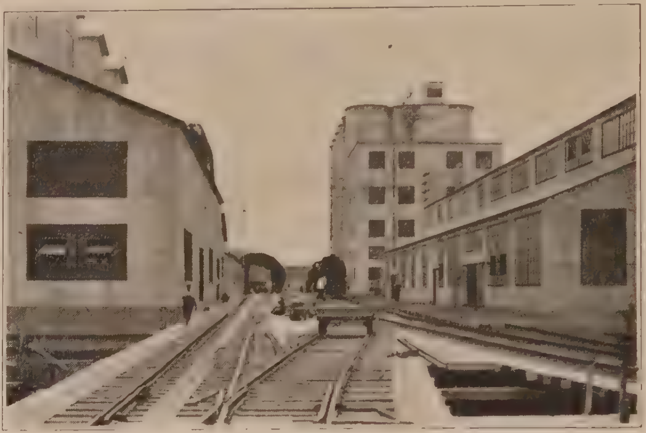
The dump has a maximum capacity of 100-tons, including the car, and by a system of counter-weights is so constructed that a 115-H. P. motor is sufficient for operation.

The plane upon which the dump revolves is inclined at 30 degrees. This device is so adjusted that as the dump begins to revolve, the car and track shift slowly to the downward side of the car dump and at the same time a set of 6 automatic clamps slowly descend on the top of the car, holding it firmly in place. After dumping, as the car dump descends down the incline toward its original position, the car and track automatically move back to the center of the dump as it stands in a vertical position. This is accomplished by means of finely adjusted plunger springs—the whole operation being so set that there is no jar or tremor whatever. Only 6 minutes are required from the time the loaded car is run onto the dump until the empty car is pushed off, and in a test run it has been possible to handle 10 cars an hour without difficulty. One operator handles the entire operation and is assisted only by a brakeman and a locomotive to handle the incoming and outgoing cars.

From the pit below the car dump, the material is lifted by a Whiting crane with a 4-cu. yd. orange peel bucket to a hopper 90-feet high, from where it is fed to the Fairmont crusher.

Dorr Thickener:

During the rainy season, the rock absorbs some water at the quarry and in transportation, and as a result is somewhat sticky and hard to handle in the crusher, making it necessary to flush the breaker plates of the Fairmont crusher in order to keep this equipment from clogging.

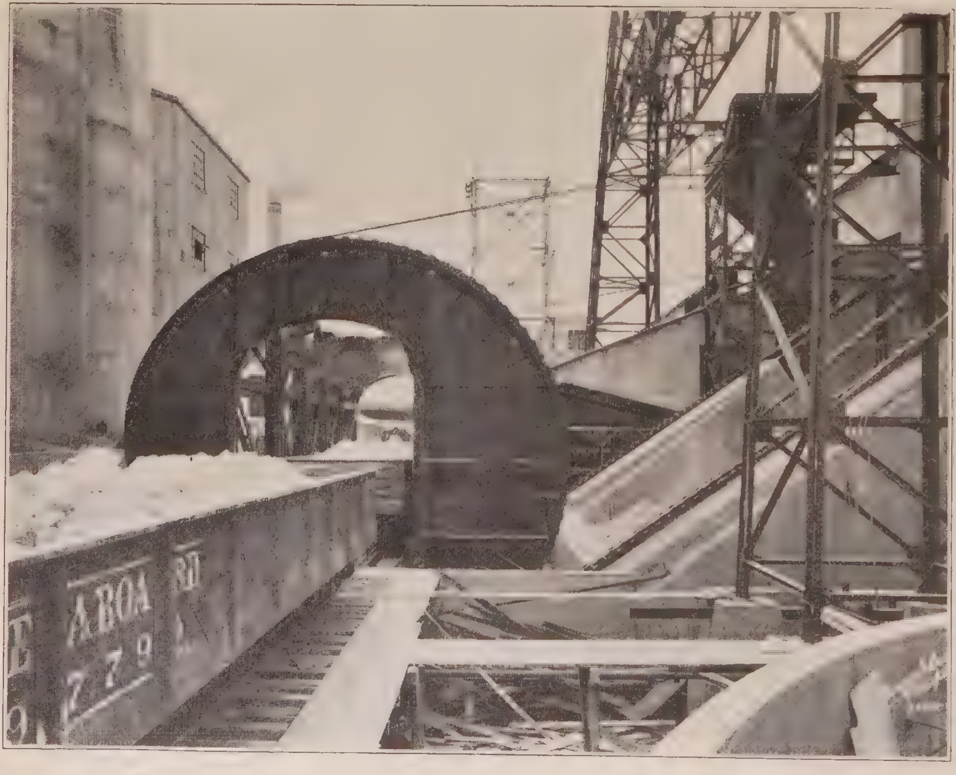


Showing the location of the car dump

As it is undesirable to have an excess of water in the stone storage, the material as it is discharged from the Fairmont crusher goes to a rotary screen which serves a double purpose:

1st: Of separating the water, the material held in suspension, and the finely crushed material from the larger particles, and

2nd: Conveying the large particles to a Dixie-Hammer mill for pulverizing.



A Wellman-Seaver-Morgan car dump picks up the car of raw materials bodily and dumps them into a concrete pit from which they are distributed. Only 6 minutes is required to dump a car load of material

As the raw materials are transported a distance of about fifty miles and the freight in the course of a year amounts to a considerable item, it is desirable to re-claim all of the material held in suspension in the water and the finely ground material which has passed through the rotary screen. This is accomplished by a Dorr thickener which acts as a reclaiming basin, taking out the solid matter and returning the clarified water to pumps where it is again used in the crusher. This thickener is not in continuous operation as during the dry season it is unnecessary to flush the breaker plates with water.

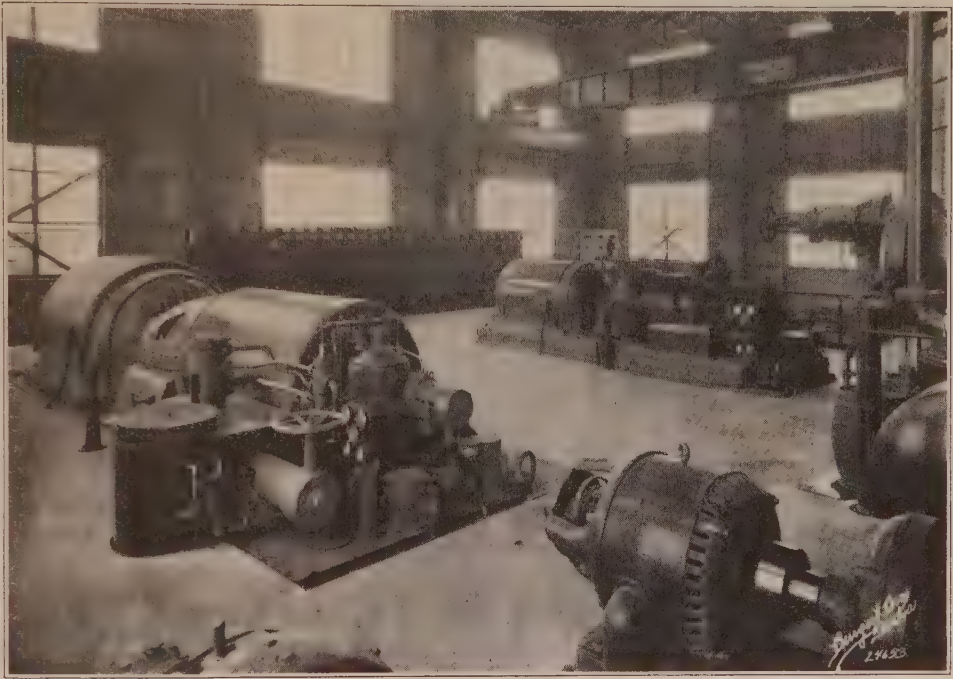
The Dorr thickener is a concrete basin 60-feet in diameter and 12-feet high and, revolving within it, are plates which agitate the material. It is operated by a 7½ H. P. motor.

Boiler House:

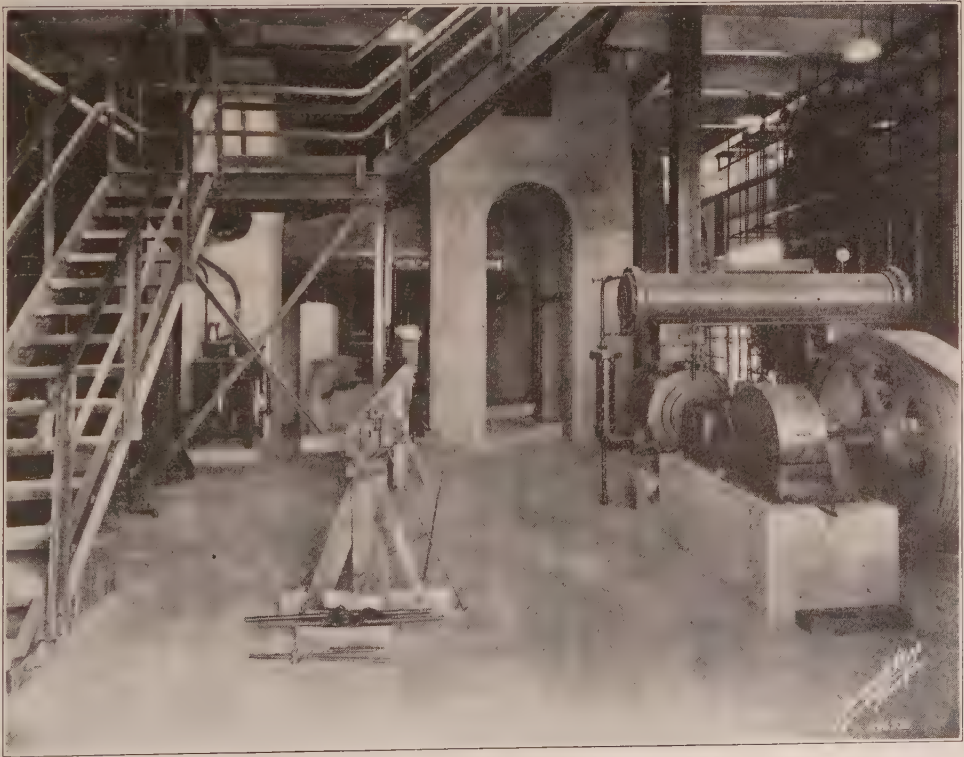
The boiler house equipment consists of three 969-B. H. P. Edge Moor waste heat boilers and one 400-B. H. P. hand fired Edge Moor boiler. The draft through the boilers is maintained by Green fuel economizers with double inlet fans driven by 150-H. P. Allis-Chalmers slip ring motors. The boilers are of the 4-pass water tube type.

The fans discharge the gas into a dust collector system patented by Dust Recoveries, Inc. of New York, which is guaranteed to remove 92 per cent of the dust from the entering gases.

After passing through the dust collector, the gases enter a 200-ft. concrete stack which is 13-ft. in diameter at the



Generating equipment consists of a 4000-K. W. reaction turbine. A 1250-K. W. unit has been provided for starting purposes and as a safeguard against peak loads

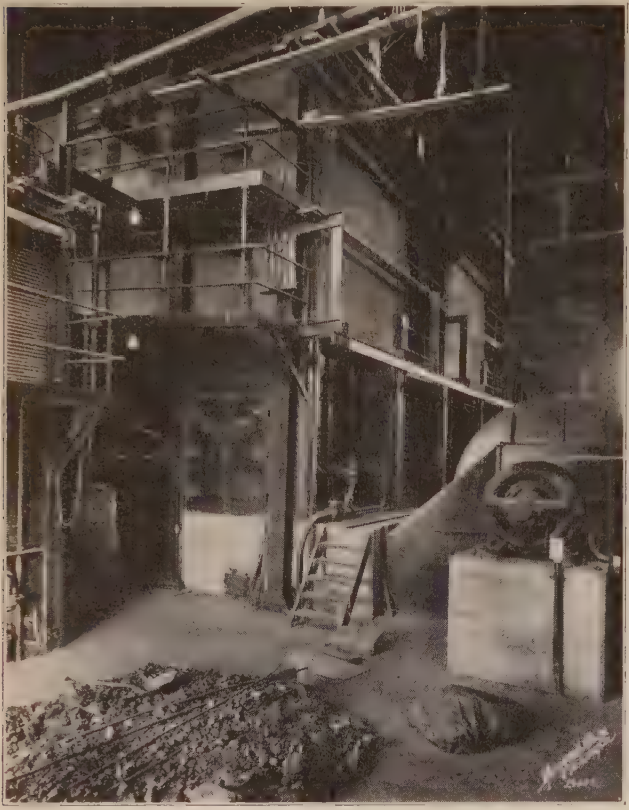


Compressed air for slurry agitation and for the Fuller-Kinyon pumps is supplied by two air compressors, each having a capacity of 806 cu. ft. per minute bottom and 10-feet at the top.

A complete set of waste heat instruments made by the Republic Flow Meter Company gives a picture of temperature and draft at the kiln housing, and at the four passes in the boiler, at the economizers, and at the fan inlet. A complete analysis equipment is maintained with frequent checks on the quality of the stack gases.

Evaporator:

As the water used in the boilers is of high saline content and has a tendency to clog the tubes, a Griscom-Russell evaporator has been installed. This utilizes the waste steam from the boiler, passing this steam through the evaporator, turning the entering water into steam. The condensate is carried to a storage tank which has a capacity of 40,000 gallons and is held as a reserve for boiler feed.



Boiler house equipment consists of three 969 B. H. P. Edge Moor waste heat boilers and one 400 B. H. P. hand-fired boiler

Power House:

The generating equipment consists of one 4000-KW. Allis-Chalmers reaction turbine. As this turbine has an 80 per cent power factor, under normal conditions it has sufficient capacity to take care of the operating load of the plant.

For starting purposes and as a safeguard against peak loads, a 1250-KW unit similar to the larger installation has been provided. These turbines are equipped with Griscom-Russell air coolers and Allis-Chalmers surface condensers.

A switchboard manufactured by the General Electric Company has been installed, with a consideration for attractiveness as well as efficiency. The panels are on the turbine operating floor with the oil switches and bus bars directly beneath the basement inclosed by safety wire netting.

Compressed air for slurry agitation and Fuller-Kinyon pumps is supplied by two Chicago Pneumatic Tool Company Air compressors each having a capacity of 806 cubic feet per minute. These are driven by 125-H. P. Allis-Chalmers induction motors through Allis-Chalmers Texrope drive. The air compressors are located in the basement of the power house and come under the supervision of the power house engineer.

A large doorway is provided in the basement of the power house level with the ground in order to admit a truck to receive or discharge any materials or repair parts.

A 20-ton Whiting crane is installed in the turbine room for handling equipment.

Electrical Equipment:

As the plant is situated within the City Limits of Tampa, the electrical work came under regulations imposed by the building code of the city. This necessitated carrying all transmission lines on steel towers, with a 30-ft. clear space between railroad tracks beneath and the lowest cables. It also made it necessary to carry the current from the towers to the buildings by means of a lead-covered armored cable.

All details of the electrical equipment were installed with the idea of passing a most rigid inspection and withstanding the hardest service.

Coal Dryer:

As far as is known, the plant is the only cement mill using pulverized coal as fuel operating without a coal dryer. The installation consists of three improved special low-side Raymond 5-roller mills with a hot air connection which makes it possible for the exhaust fan on the mill to draw hot air through a pipe connected to a jacket on the burning end of the kilns. Air is delivered to the mill at a temperature of 340 degrees Fahrenheit which is sufficient to take out the moisture in the coal to the required point. The mill is entirely free from dust and one of the most satisfactory departments in the plant.

Three Raymond 5-roller mills, pulverize the coal. Hot air, taken from jackets on the kilns, takes the moisture from the coal.

Cement Making From Waste Materials

Some By-Products and Industrial Wastes That Could Be Utilized as Raw Materials in Cement Manufacture

By E. T. ELLIS, F. J. I.

THE manufacture of cement from waste materials may be said to be in its infancy only at the present time. If, however, the subject be carefully examined there is no reason at all why many waste products should not be made use of as raw material for cement, while as trade continues to develop along new lines fresh by-products may come to light which can also be turned to advantage.

In this paper I am only selecting half a dozen aspects of the question for consideration, but if the subject arouses interest it may be possible to discuss it further at a later date.

Blast Furnace Slag Waste: A Valuable Cement Making Material

I should like first of all to draw attention to common waste blast furnace slag. Enormous dumps of this have accumulated, and although some of it is now used as road metal, it is far more economical to make it into cement.

Details of an actual process of preparation are somewhat meagre, but a published prescription for utilizing blast furnace slag as a cement making material reads as follows:

	Per cent
Blast furnace slag sand	70
Oxide of iron	15
Burnt lime	15

The mixture is ground under edge runners, and presumably it is fired in the same way that ordinary cement mixtures are until it begins to sinter.

Cement prepared from waste blast furnace slag appears to be as good in almost every respect as that prepared from any of the recognized formulae, or from cement nodules.

Calcium Carbonate for Cement Making from Several Waste Materials

The lime required by cement makers is very readily obtained from different trade wastes, and it certainly ought not to be necessary to quarry limestone specially for the purpose.

Cement makers may probably not be aware of the fact that a number of hydrocarbons are prepared by heating different organic salts with quicklime, and that after the reaction has taken place a residue mostly of carbonate of lime remains in the retort.

Then again, in softening water a considerable residue consisting largely of carbonate of lime is produced, and this also is a valuable cement making material.

Yet another instance is furnished by the nitrate industry. In one of the processes of preparing saltpetre, potassium carbonate and calcium nitrate solutions are mixed, and a large volume of insoluble chalk is at once precipitated.

Numerous other processes might be mentioned in which chalky material or more or less pure carbonate of lime is produced in considerable quantities as a by-product. This carbonate is peculiarly suitable for cement making on account of the fact that it is relatively free from impurities, and owing to its insoluble character can be washed and re-washed as often as necessary should contamination be feared. If quicklime is desired the waste product has, of course, to be burnt in exactly the same manner that ordinary chalk is.

Magnesia Cements from Many Forms of Refuse

Ordinary cement, of course, contains quite a small percentage of magnesia, though slag cement frequently shows the presence on analysis of a very much larger quantity. Cement makers, however, who go in for the preparation of special magnesia cements, which chemically are mixtures of magnesium oxide and magnesium chloride, will be delighted to know that these may be prepared from a fairly imposing number of waste materials.

Dolomite or magnesium limestone is frequently employed as a source of lime in the manufacture of gypsum or plaster of Paris. When this rock, however, is treated with sulphuric acid after, of course, being finely pulverised, the waste waters show on analysis a fairly imposing quantity of magnesium sulphate or Epsom salts to be present. After filtering off the gypsum, the magnesia is easily precipitated as the hydroxide, and on calcining this the oxide remains. The chloride is, of course, easily producible by the usual methods from the hydroxide or the solution containing the soluble sulphate of magnesia can be mixed with a concentrated solution of the chloride of another metal whose sulphate is insoluble. Double decomposition will then take place, and soluble magnesium chloride will remain in solution.

Another waste material which it has been suggested might be useful as an ingredient of magnesia cement is the magnesite brick or the magnesite stone which is taken out of furnaces after it has served its purpose as a lining material. Details of this process are very scanty, and I doubt if it has ever been commercially practised, but the magnesia could be got into solution by treating the finely pulverized material with concentrated sulphuric acid, the impurities, of course, being filtered off after diluting the solution. Once the metal is in combination with an acid its precipitation is, of course, an easy matter, and on obtaining the hydroxide this is reduced to the oxide, and that used as before for mixing with magnesium chloride in the preparation of magnesia cement.

A considerable quantity of potash salts are imported in a crude form from European deposits, and on purifying these a waste liquid remains which contains much chloride of magnesia. This must, therefore, be regarded as a valuable source of the second ingredient of magnesia cement namely, magnesium chloride, this salt being obtainable by cautious evaporation. Purification is desirable, but an account of the methods used cannot be given here on account of space. Suffice it must to point out that magnesium chloride is subject to hydrolysis, and to prevent this its aqueous solutions should be acidified with hydrochloric acid.

Silica for Cement from China Clay Residues

I must call attention to quite a different waste material which is none the less valuable for cement making. In the preparation of china clay for the pottery trade a considerable quantity of siliceous residue is separated, and up to now little if any use had been found for it. Examination of this waste material shows that it is sometimes mixed with small portions of undecomposed granitic rocks, and if the presence of these is considered objectionable, separation by washing or by centrifugal sifters may be necessary.

Sufficient of this waste china clay silica is then added when mixing the chalk, clay, or other ingredients together to give the product after it has burnt a composition showing not less than twenty per cent and not more than twenty-four per cent of silica.

Waste Granite: A Source of Cement Makers' Clay

Just as the lime required by the cement maker can be obtained from waste materials so also can the clay, but the process is not a rapid one, and may possibly be too slow for some firms.

It has been found that hot water containing carbon dioxide under pressure acts upon finely divided granitic and other rocks, releasing their silica, and breaking them down into a clayey material. This is exactly the reaction which takes place over a period of long years in the open ground where the atmospheric air and moisture containing small quantities of carbon dioxide act upon the rocks.

Waste granite from quarries, and indeed other waste rock of somewhat similar composition, need not, therefore, any longer accumulate on the spoil banks, but should be broken down, and both its silica and its clay used by cement makers. Plenty of carbon dioxide can readily be obtained for the carrying out of this operation, as the gas is, of course, that produced by the burning of fuel of all kinds, and is given off into the atmosphere by every works' chimney.

There are, of course, more speedy processes for using up waste granite as a material for cement mills, but unfortunately most of these are very expensive, and necessitate the employment of very powerful acids such as hydrofluoric to dissolve the granite. The carbon dioxide idea, therefore, is up to now undoubtedly the best, and probably further research will show that by working at a considerably enhanced pressure or by much increasing the temperature the disintegration may be made to proceed more quickly.

Zinc Cements from Hydrogen Works' Waste Solutions

The ordinary cement manufacturer does not do much with zinc cement, but some firms have specialized in the production of the so-called dental cement which consists virtually of mixtures of zinc chloride and zinc oxide.

Zinc chloride can very readily be obtained, and it is present in very imposing quantities in the waste solutions from works where hydrogen gas is prepared by the action of hydrochloric acid on granulated zinc. It is obtained from such solutions by evaporating them as it is soluble in water.

If to a solution of zinc chloride a solution containing an alkaline hydroxide such as caustic soda be added zinc hydroxide is precipitated, provided that there is not an excess of the other reagent. This is filtered off and strongly heated to remove its combined water, and the monoxide, which can also, of course, be obtained by burning the metal in air, then remains, It will thus be seen that both the active ingredients required for zinc cement can be obtained from the waste solutions of hydrogen works.

In those instances where sulphuric acid is employed by the works to dissolve the granulated zinc in the production of hydrogen it is desirable to mix the waste waters, which, of course, contain dissolved zinc sulphate, with a concentrated solution of calcium chloride. Calcium sulphate or gypsum is precipitated, and zinc chloride remains in solution, and can be obtained from this by evaporating in the usual way. Zinc hydroxide is precipitated as before if the solution is mixed with one containing caustic soda, and thus it will be seen that both the waste liquids of hydrogen works can be used satisfactorily as sources of zinc cement.

Finally I would point out that while it may be contended that some of the processes briefly mentioned may not be practical, they all seem to me to be well worth while seriously considering. We are living in a wonderful age, and processes which would not have proved profitable twenty years ago pay handsome dividends in these days.

Inquiry Begun Into Method of Establishing Prices

Methods used in quoting and charging the prices the consuming public must pay for the necessaries of life will be the subject of a comprehensive survey by the Federal Trade Commission according to the publication for the first time of a resolution adopted by the commission and termed the "price bases resolution."

Three definite modes of quoting and charging prices with reference to locality of the purchaser will be studied and reported on by the economics staff of the commission. Three such systems of price fixing are mentioned by the commission as (1) the delivered price method, (2) the factory base method, and (3) the basing point method.

It is pointed out that numerous companies who distribute their products in various states of the union are quoting prices in which no allowance is made for difference in transportation costs in widely separated markets. This is called the delivered price method. Then other distributors employ the policy of quoting uniform prices at the factory, with freight charges added according to the locality of the consumer. This is termed the factory base method. Still others follow the practice of adding to the market prices at a certain basing point the freight charges from that point to the locality of the consumer. This is the basing point method.

Starts Four Inquiries

It is expected that facts and data of lasting value to business and industry will be the result of the commission's inquiry into the various practices regarding price bases and that through this study of competitive conditions will develop new and constructive measures for obtaining greater efficiency and economy. The report also will form a basis for determining what are the fair practices in this regard.

This will be the fourth recent undertaking of its kind by the commission on its own initiative for employing its corps of experts on problems involving the welfare of the buying public.

EDITORIALS

Colored Cements

ONE of the things that has been most noticeable to us in our work of editing the Regular Edition of "Concrete" has been the rapidly developing interest in colors among all classes of concrete users. Articles which we have published regarding the coloring of concrete work have been received with more than usual interest, and our correspondence includes a continual flow of letters from those who are interested in knowing more about the best methods of coloring concrete. Our inquiries do not come alone from those who actually do the concrete work, but also from architects, prospective builders, and others who are interested in knowing just what can be safely attempted along this line. Very often the answer to an inquiry is the determining factor in deciding whether or not a particular piece of work shall be done in concrete at all, for there are many situations in which the possibility of coloring the work has an important influence in deciding the material of which it shall be made.

This same development has been going on elsewhere, and in England it has resulted in the preparation of colored cements by the cement manufacturers themselves. They, being in a better position than anyone else to combine the materials properly for grinding the cement and pigments, have in this way provided a reliable means of coloring concrete which has none of the faults that are apt to characterize home made mixtures of cement and colors. Colored cement made from such factory-prepared concrete is much more apt to give real satisfaction than that which is prepared on the job by operatives unfamiliar with the proper use of colors in connection with portland cement.

There would appear to be an opportunity for some American cement manufacturer to materially add to his sales by placing on the market such a line of prepared colored cement. There is little doubt but that a ready market would be found for them, and that they could be sold for prices which would permit of a very wide sales area. It is surprising that some enterprising manufacturer has not already taken advantage of this opportunity.

Mechanical Progress

MECHANISM and improved organization have so improved the productivity of the manufacturing industry in the United States since the beginning of the century that on an average 67 workers in 1925 produced as much as 100 men turned out in 1899, despite the shorter hours now prevailing, according to a study of productive efficiency made by the National Industrial Conference Board and recently published.

The specific figures for the cement industry were not given in this report but the findings of the Bureau of Labor Statistics, Department of Labor, show the great increase in productivity made by the cement industry. Setting the output per man hour at 100 per cent in 1914, the Bureau found that the 1925 output per man hour was 157.8 per cent.

The Industrial Conference Board also points out that if the productivity of industry through mechanism should continue to increase at the same rate for the next 25 years, it would at the end of that time require only 45 men to produce what 100 men produced 25 years ago.

In the cement industry progress in mechanization is steadily going on. The industry keeps a careful record of production in terms of man hours and uses this information as the basis for improvement.

New plants that have recently been completed illustrate the progress being made. Oversize units, more efficient equipment, labor-saving devices, automatic control of operations and other improvements are the rule. Not only in the construction of new plants, but in the rebuilding of old plants, the work of improved mechanization is going forward. One cement plant that used to employ 250 men was rebuilt and modernized and as a result, even with increased production, the force was reduced to 100 men. Manufacturing costs were reduced 40 per cent. The equipment maintenance and repair costs were reduced from 18 cents per barrel to 5 cents per barrel.

Another factor that did much to increase the production per man hour was the phenomenal decrease in lost time accidents resulting from the organized efforts to promote safety in cement plants. Not many years ago a cement plant was considered a hazardous place to work. Today there are many plants that go through an entire year without a lost time accident —an important contribution to manufacturing efficiency.

Those factors of mechanization and organization that have influenced progress to such an extent in the past will, if their encouragement is continued, persist in making still greater progress. The last word in cement mill equipment and manufacturing methods has not yet been spoken.

MEN and MILLS

Notes from the Field

Canada Cement Company Plants Sold

Sale Price Was $46,875,000—Nine Mills Included—New Company Formed—Bond Issue Forthcoming

SHAREHOLDERS of the Canada Cement Company, Montreal, on October 14th voted to accept the offer made by Wood, Gundy & Company, Limited, of Toronto, Ontario, for the purchase of the assets of the company. $250 a share was paid for the common stock and $125 for preferred stock. The actual purchase price was $46,875,000, one of the largest financial transactions in the Dominion, being equalled only when issues of government Victory bonds are retired.

Employees of the nine mills which are a part of the company will receive about $6,000,000 for stock they hold in the company, it is reported. When Canada Cement was first organized 15 years ago, the chain of plants was valued at less than $10,000,000. The present sale price of the Port Colbourne plant, one of the largest, was placed at $5,000,000.

A new company of the same name has been formed, with a capitalization of $20,000,000 in 20-year, 5½ per cent mortgage bonds and $21,000,000 in 6½ per cent sinking fund cumulative preferred shares, as well as 600,000 common shares of no par value. Bonds are to be issued shortly.

The new company includes all members of the previous board, with the addition of three members, Sir Herbert S. Holt, J. H. Gundy and J. D. Johnson. The official personnel of the new company includes A. C. Tagge, president, J. D. Johnson, vice-president and general manager, H. L. Doble, vice-president and comptroller, and F. B. Kilbourn, general superintendent. F. P. Jones, former president, will be a director.

Alkali Firm Reported To Be Designing Cement Plant

From Saltville, Virginia, comes a report that the Mathieson Alkali Works, Inc., is designing a new cement plant, to have a capacity of 1,000,000 barrels per year. It is now completing a rehabilitation program begun in 1925.

Chelsea Plant Permanently Closed, Report

Latest reports state that the Michigan state cement plant is shut down permanently, and that a quarter of a million dollars was lost in 1927.

A proposal other than that of selling the plant to private concerns is that of stopping the payment of installment notes and allowing the entire property to revert to the former owners. The 1,000 acres of swamp that are part of the property could be used as a game preserve.

Edison Throws Switch for Largest Blast

An interesting but not spectacular blast set off by Thomas Edison, at New Village, New Jersey, and near the cement plant which bears his name, was one of the largest ever made in a cement quarry in that part of the country. Estimates place the quantity of loosened rock at from 150,000 to 170,000 tons.

The blast was set in the tunnel system. One tunnel 80 feet long was driven directly under the wall of the cliff to be blown away, and perpendicular to its face. Forty feet in were two lateral tunnels, 37 feet on one side and 68 feet on the other, and at the 80 foot mark were two other laterals, 22 feet and 76 feet long. Fifteen tons of dynamite were used in packing these tunnels.

The loosened rock was pushed from the face of the quarry and thrown horizontally a distance of about 170 feet toward the center of the pit.

Electrical connections had not been completed until Mr. Edison arrived on the scene. At a signal a switchboard lever was thrown by a worker to make the next to final hookup. One of the Edison party then tapped the inventor on the shoulder as the signal to throw the switch.

Asked what his impression of the blast was, Mr. Edison said, "It was not adapted to our kind of rock. Our rock is too soft and does not offer the proper resistance to this kind of a blast."

Lehigh Gives Large Tract of Land to State

A contribution of 320 acres of land in Lawrence County, Indiana, has been made by the Lehigh Portland Cement Company to the state, to aid in the development of Indiana's state park system. The land has been turned over to the state conservation department as an addition to a tract of 183 acres now owned by Indiana University, but to be purchased shortly for $10,000. The Lehigh gift brings the new park reservation up to the 500-acre minimum size required before the new state park may be created.

Universal District Sales Manager Dies

William H. Matthews, Jr., district sales manager of the Universal Portland Cement Co. at Cleveland, died in Lakeside Hospital in that city, October 15.

Mr. Matthews was 46 years old. He came to Cleveland from Pittsburgh in 1910 to work for the Universal Portland Cement Co. He was a member of the Cleveland Chamber of Commerce, Clifton Club, Cleveland Athletic Club and the blue lodge, chapter, Lake Erie Consistory and Holy Grail Commandery of the Masons.

Price Vice-President in Charge of Sales

Paul R. Price has been appointed vice-president in charge of sales by the Marquette Cement Manufacturing Company, at Chicago, Illinois.

Find Cement Plant Site in Wyoming

An ideal cement plant site as yet untenanted has been located near Casper, Wyoming, according to John G. Marzel, state geologist. The town has natural gas in abundance and huge deposits of raw material are to be found in Casper mountain, nearby.

Earles Cement of England has decided that it is no longer necessary to shroud cement manufacturing methods in a cloak of secrecy. As shown by the above illustration, they are letting the layman in on the secret rites, withholding nothing

Montana Cement for British Masonic Memorial

The United Grand Lodge of English Freemasons has received from the Grand Lodge of Montana one-half ton of Montana cement, to be used in cementing together some of the stones in the new Masonic Peace Memorial about to be erected on a site adjoining the London Freemason's Hall. In the letter accompanying the gift the hope is expressed that the cement, thus spread in the new temple, would symbolize a new and binding union between the mother lodge of the world and the Grand Lodge of Montana.

General Sir Francis Davies, Provincial Grand Master for Worcestershire, who is the representative of the Grand Lodge of Montana at the United Grand Lodge of England, in a letter of appreciation of the gift, said that the Montana brethren had been well inspired in choosing cement, as by so doing, they symbolized the close brotherhood of Freemasons all over the world, and more especially among the English-speaking peoples.

Fortuin Completely Recovered

Morris Fortuin, general manager of the Pennsylvania-Dixie Cement Corporation, at Nazareth, Pennsylvania, is again at work. Mr. Fortuin recently underwent an operation and was absent for three weeks.

Ground Ready for Missouri Quick-Hardening Cement Plant

Grading and excavation is well under way for the construction of the Missouri Portland Cement Company plant at Batesville, Arkansas, to produce quick-hardening cement.

A portion of the machinery is on the ground and contract for the building is to be awarded shortly.

Michigan Price Cutting Follows Withdrawal of Orders Placed with Independents

Michigan cement prices have been radically cut in retaliation of the state's recent decision to cancel orders for 100,000 barrels of cement previously given to independent manufacturers. It is thought that the state plant at Chelsea will shortly reduce its price. The matter is to be brought before the administrative board at its next meeting.

At Jackson, where the state is using a large amount of Chelsea cement in constructing the new prison, the reduced price is 15 cents a barrel lower than is being paid the state-owned mill. The prison commission has been allowing Chelsea \$2.04 a barrel net. The product can now be purchased on the open market there for \$1.89 net.

Atlas Elects Wm. Erdell a Director

Wm. E. Erdell, of Allentown, Pennsylvania, was elected a member of the board of directors of the Atlas Portland Cement Company at a meeting of the board in New York City, on September 27th.

Mr. Erdell's entry into the cement field dates back to 1888 when he was employed by the American Cement Company, now the Giant, at Egypt, Pa. In 1901 he became superintendent of the Whitehall Portland Cement Company plant at Cementon and remained there until 1907, when he became associated with the Penn-Allen Cement Company. He remained with that organization until it was sold to the Dexter Portland Cement Company, in 1926. Since that time he had devoted his attention to construction activities.

Batesville Lime Company to Add 3 Kilns

Announcement has been made by George Weigart, president of the Batesville White Lime Company, of Limedale, Arkansas, that plans have been completed for the construction of three additional kilns at the plant. Production will begin in January, 1928.

The cost is estimated at \$150,000, bringing the investment up to \$400,000.

Pruder gas fuel will be used to fire the kilns. The latter will raise the capacity to 1,500 barrels a day.

Ash Grove Gas Properties in Merger

The gas properties of the Ash Grove Lime & Portland Cement Company, Kansas City, Mo., are included in a merger forming the Southern Kansas Gas Company, with gas rights on 76,000 acres of leases and gas purchase contracts on 9,800 acres in a number of Kansas counties.

Virginia Plant Fills Demand by Doubling Storage Capacity

November 1st marks the completion of six new additional silos at the South Norfolk plant of the Virginia Portland Cement Corporation, International subsidiary. This doubles the capacity and permits operation at capacity the year around.

Demands for the cement have been such during the current season as to make economical an expenditure of $150,000 to increase the storage capacity. It has frequently been necessary recently to turn over some orders to other International plants.

The new silos are 80 feet above the ground and extend 20 feet below ground, resting on 1,631 piles driven to a distance of 48 feet below mean low water. Each silo is 32 feet in diameter. In addition, there are six storage bins.

The General Engineering Company, of Chicago, was the silo contractor, and the W. V. Murray Company was the contractor for the pile work.

Vulcanite Head Escorts Party on Super Cement Jobs

President Alfred Moyer of the Vulcanite Portland Cement Company was the host at Detroit on September 28th and 29th to a party of thirty engineers, architects and contractors from New York, Philadelphia, and Boston. Much time was spent in visiting two large Detroit construction jobs in which Super Cement is being used.

Change in Shipping Clause

The government's Inland Waterways Corporation, a barge line operating the Mississippi-Warrior Service, has announced that it will assume liability for loss incurred "through acts of God." Members of the Denver Chamber of Commerce have asked the transporation committee of the chamber to induce railroads to make the same grant. The committee has the matter under advisement.

Obituary—"Old Man Accident" Buried by Lehigh Mill

All work was suspended September 21st in the Lehigh quarries at Union Bridge, Maryland, to permit a "No Accident" celebration being held near the former marble quarries.

A funeral procession in honor of "Old Man Accident" began near the entrance to the grounds and was headed by the "Old Man" borne on a stretcher. He was conveyed to a grave prepared on the grounds and buried with appropriate services. The man had expired on May 19, 1926.

Baseball and refreshments followed. 175 persons, including guests, were present.

Lehigh Plant Installs New Machinery; May Be First in Indiana Production

Machinery that has been turning the wheels at the Mitchell, Indiana, plant of the Lehigh Portland Cement Company, will be supplemented and replaced by new equipment about ready to be installed.

The Mitchell plant is second in production in the state and the new machinery will probably put it in first place.

Plant Representatives Escort Users Through Indiana Plant

Twenty-five contractors, architects, city and county officials were the guests of Mather Bros. Company, representatives of the Indiana Portland Cement Company, at Richmond, Indiana, on an inspection tour of the plant in Limedale, Ind., on Tuesday, September 20th.

South Dakota Chemist Joins Dewey

Edgar S. Ernst, for some time chemist at the South Dakota state cement plant, at Rapid City, has joined the Dewey Portland Cement Company at Davenport, Iowa, as chemist.

American Makes Change in Stock

The American Portland Cement Company, Little Rock, Arkansas, has filed notice in the office of the secretary of state recently that it has changed $250,000 of preferred stock to common stock of $10 par value and that the original common stock has been increased from $600,000 to $1,000,000, consisting of 100,000 shares of a par value of $10 each.

American Plant Project for Arkansas Revived

The American Portland Cement Co., has finished a temporary office building at Foreman, Arkansas, to be followed by a rough storage building. The latter is to house building supplies to be used in the construction of permanent buildings for the proposed cement plant. Railroad tracks, to the St. Louis and San Francisco Railway, have been laid and as soon as the temporary storage building is completed, material for the main cement structure will be received.

The plant will have a capacity of 2000 bbls. daily, as well as equipment for chalk grinding for whiting and agricultural limestone.

The firm was organized by F. R. Hansell, A. Celow, and John A. MacPeak, of Camden, New Jersey. C. E. Oxford, 245 W. 51st Street, New York City, is the managing director.

War Continues Over New Brighton Rates

Impetus has been given the revolt being participated in by several eastern mills against existing gypsum freight rates from New Brighton, New York, to mills in Pennsylvania by the addition of the Lehigh Portland Cement Company to the "rebel" forces. The North American Cement Corporation is already in the fight to convince the Interstate Commerce Commission that rates should be lower. New Brighton is said to be the world's greatest gypsum rock transshipping center.

The plant counsels claim that the railroads have no defense in asserting that if relief is granted to Maryland and York, Pa., points that producers and dealers in the Hudson river and Lehigh Valley districts will claim similar relief, as they are already doing by allying their own fortunes with those of the Lehigh and North American corporations.

Baltimore and Ohio attorneys claim that gypsum rock shows discrimination in deciding in which territory it shall lay its beds. In the United States, they say, west of the Mississippi river, only two gypsum rock beds are in existence, with one in Virginia and one in New York. Much of the gypsum rock received in this country is mined in Nova Scotia, being shipped to the United States via New Brighton on Staten Island, they continue. So little of it is shipped, though, they say, that the railroad should not be placed in the position of making a mad scramble to obtain the business of transporting it. Within six months only forty-eight carloads of the commodity were received by the railroads, they claim. The railroads take the view that the gypsum rock could be received at a point in upper New York and thereby save freight rates.

Lehigh Loses Head of Traffic Department

Oliver H. Mickle, head of the traffic department of the Lehigh Portland Cement Company at Allentown, Pa., died suddenly of heart disease Sunday, Sept. 11th.

Former Atlas Engineering Foreman Dies

Wm. R. Smith, former burgess of Coplay, Pennsylvania, and until two years ago foreman of the Atlas engineering department for thirty years, died August 30th. Death was the result of a lingering illness from complications. Mr. Smith was 67.

Four California Manufacturers Join in Bid for Flood Control Dam Cement

So great is the quantity of cement required for the San Gabriel flood control dam in Los Angeles county, California. that no one of the great California manufacturers is able to supply it from present plants, it developed when bids were opened by the Board of Supervisors and it was found that the four largest concerns had entered a joint bid.

This tender, the only one received, is for delivery of 2,600,000 barrels of bulk cement at a price of $1.77 per barrel, f.o.b. cars, Crestmore or Colton, it being provided if shipment is made from any other point the freight differential will be absorbed. At this price the cement called for in the specifications would cost a total of $4,602,000, plus freight.

An alternative bid at $2.22 per barrel for cement in sacks was submitted. At this price the total cost of cement would be $5,777,000. It is for the supervisors and their engineers to decide whether advantages in handling would offset the higher cost of sacked cement.

With the bid there was forwarded to the board a letter from the manufacturers setting forth the reason they joined in a common bid was that the order was so large not one of them could guarantee deliveries at the rate called for without increasing plant facilities, and thus adding cost. There was also submitted a copy of the four-company agreement, providing for selection of a trustee to collect and disburse funds received in payment.

The undertaking of each of the four companies is as follows: Riverside Portland Cement Company, 850,000 barrels; Southwestern Portland Cement Company, 500,000 barrels; California Portland Cement Company, 850,000 barrels; Monolith Portland Cement Company, 400,000 barrels.

Surety bond in the sum of $200,000 guaranteeing faithful performance, was offered with the bid.

Proposed New Cement Works for Britain

Cement manufacture on a large scale is about to be commenced in the Hope valley in the Peak district of England, not far from Sheffield. The matter has recently been considered by the Chapel-en-el-Frith Rural District Council, which, on the recommendation of the Highways Committee, has approved the project, subject to the usual safeguards. The buildings, etc., will cost about $2,000,000 and about $150,000 per year will be paid in wages. The project has been warmly welcomed in the district, where opportunity for the employment of labor is scanty.

The undertaking will generate some 30,000,000 units of electricity annually, and the current will be available for the residents of the district. An adequate supply of water, giving 12,000 gallons an hour, has been discovered on the site. A light railway will be constructed for the purpose of carrying the cement from the works to the nearest branch of the London, Midland & Scottish Railway. This line will be about two miles in length, and will, it is anticipated, cross a main road. The works are to be established by the Earle interests of Hull.

Installing Volunteer Machinery

Machinery is being installed in the Volunteer Portland Cement Company plant at Knoxville, Tennessee, and work is about half completed.

Son of Bonneville Cement Company Founder Dies

Wm. G. Bonneville, of Allentown, Pennsylvania, died suddenly on August 19th at his summer home at Shelter Island, Long Island.

He was for many years connected with the Bonneville Cement Company, of which his father was the founder. He had retired from active business life in the past few years.

Penn-Dixie Entertains Its Alabama Dealers

Three special Pullmans conveyed a delegation of 65 dealers representing the Penn-Dixie Portland Cement Company in Alabama to Chattanooga, Tennessee, on August 25th. Automobiles there took them to the plant at Richard City for an inspection trip.

International Financial Report on Third Quarter

The thirty-first quarterly report of the International Cement Corporation, covering the third quarter of 1927, has just been published. Earnings, after allowing for preferred dividends are equivalent to $4.94 per share for nine months on 562,500 shares of common stock.

New Ideal Plant

The Ideal Cement Company expects to start operations in its new plant near Fort Collins, Colorado, November 15. A contract has been signed with the Colorado-Wyoming Gas Company to supply it with natural gas. It will use between five and six million cubic feet daily and have a daily output of about 3,500 sacks.

Quite a bit of development in cement storage has been made since structures such as this one at Egypt, Pennsylvania, were used. Cement was stored in bins in this stock-house and later shoveled into barrels. Grinding stones used in about the same period may be seen in the foreground

Cement Statistics for September

SEPTEMBER production and shipments of portland cement were at nearly the record high rate set in August and were nearly 6 to 10 per cent, respectively, greater than in September a year ago, according to the Bureau of Mines, Department of Commerce. Portland cement stocks are still diminishing and are slightly under those on September 30, 1926.

During the 9 months ending September 30 shipments amounted to 134,981,000 barrels, surpassing the shipments in the corresponding period in 1926 by nearly 7 per cent.

Estimated Clinker (Unground Cement) at the Mills at End of Each Month, 1926 and 1927

(Figures Represent Barrels)

Month	1926	1927
January	9,074,000	9,989,000
February	10,931,000	11,943,000
March	12,290,000	12,997,000
April	12,967,000	13,335,000
May	11,695,000	12,514,000
June	10,144,000	10,926,000
July	8,604,000	9,609,000
August	7,362,000	*7,887,000
September	6,112,000	6,459,000
October	5,370,000	————
November	5,748,000	————
December	7,799,000	————

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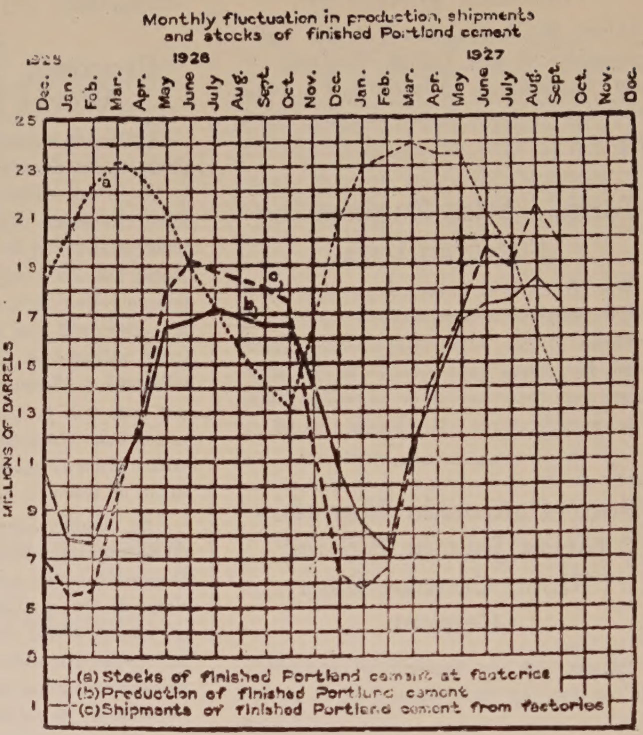
*Revised.



Production, Shipments, and Stocks of Finished Portland Cement, by Months and by Districts, in Barrels

Month	Production 1926	Production 1927	Shipments 1926	Shipments 1927	Stocks at end of month 1926	Stocks at end of month 1927
January	7,887,000	8,258,000	5,674,000	5,968,000	20,582,000	22,914,000
February	7,731,000	7,377,000	5,820,000	6,731,000	22,385,000	23,560,000
March	10,390,000	11,452,000	9,539,000	11,083,000	23,236,000	23,922,000
First quarter	26,008,000	27,087,000	21,033,000	23,782,000	————	————
April	12,440,000	14,048,000	12,965,000	14,350,000	22,710,000	23,654,000
May	16,510,000	16,701,000	17,973,000	16,865,000	21,255,000	23,503,000
June	16,866,000	17,224,000	19,134,000	19,761,000	19,000,000	20,972,000
Second quarter	45,816,000	47,973,000	50,072,000	50,976,000	————	————
July	17,134,000	*17,408,000	18,812,000	18,984,000	17,301,000	19,397,000
August	16,995,000	*18,315,000	18,583,000	21,411,000	15,718,000	*16,292,000
September	16,751,000	17,492,000	18,087,000	19,828,000	14,188,000	13,956,000
Third quarter	50,700,000	53,215,000	55,482,000	60,223,000	————	————
October	16,596,000	————	17,486,000	————	13,334,000	————
November	14,193,000	————	11,276,000	————	16,243,000	————
December	10,744,000	————	6,432,000	————	20,616,000	————
Fourth quarter	41,533,000	————	35,194,000	————	————	————
	164,057,000	————	161,781,000	————	————	————

*Revised.

Commercial District	Production—September 1926	Production—September 1927	Shipments—September 1926	Shipments—September 1927	Stocks at End of Sept. 1926	Stocks at End of Sept. 1927	Stocks at end of August, 1927*
Eastern Pennsylvania, N. J., and Md.	3,936,000	4,058,000	4,593,000	4,596,000	2,718,000	3,469,000	4,007,000
New York	948,000	1,273,000	1,194,000	1,468,000	596,000	1,170,000	1,365,000
Ohio, Western Penn., and West Virginia	1,797,000	1,804,000	1,903,000	2,352,000	1,930,000	1,734,000	2,284,000
Michigan	1,415,000	1,692,000	1,614,000	1,869,000	1,062,000	1,080,000	1,257,000
Wisconsin, Illinois, Indiana, and Ky.	2,326,000	2,472,000	2,451,000	2,564,000	1,792,000	1,139,000	1,231,000
Virginia, Tennessee, Ala., Ga., and La.†	1,368,000	1,458,000	1,428,000	1,490,000	1,029,000	1,114,000	1,145,000
Eastern Missouri, Iowa, Minn., and S. D.	1,470,000	1,481,000	1,556,000	2,014,000	*1,992,000	1,204,000	1,737,000
Western Missouri, Nebr., Kan., and Okla.	1,046,000	1,033,000	970,000	1,187,000	1,407,000	1,312,000	1,466,000
Texas	437,000	487,000	438,000	466,000	417,000	272,000	251,000
Colorado, Montana, and Utah	247,000	174,000	288,000	249,000	384,000	384,000	458,000
California	1,272,000	1,200,000	1,318,000	1,214,000	458,000	704,000	718,000
Oregon and Washington	309,000	360,000	334,000	359,000	*403,000	374,000	373,000
	16,571,000	17,492,000	18,087,000	19,828,000	14,188,000	13,956,000	16,292,000

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*Revised. †Began producing June, 1927, and shipping July, 1927.

With the Manufacturers

INDUSTRIAL LITERATURE

James Catalog

The D. O. James Manufacturing Company, Chicago, has recently issued *Catalog No. 133*, completely describing *James Generated Continuous-Tooth Herringbone* gears and speed reducers. Detailed description of the various features of Herringbone gears and speed reducers is included, together with complete illustrations of types and installations, and full specifications.

Du Pont Anniversary Number

In celebration of its 125th anniversary, *E. I. du Pont de Nemours & Company, Inc.*, Wilmington, Delaware, has issued an anniversary number of the *Du Pont Magazine.*

The publication gives a broad view of the activities of the organization and points out the intimate relationship existing between products which seem to be entirely unrelated.

Drillers' Catalog

A general drill catalog, containing 106 pages and describing the complete line of *Keystone* well drills for all purposes, as well as a number of new applications of gas power, and methods of transportation, has been issued by the *Keystone Driller Company*, Beaver Falls, Pennsylvania.

A similar publication lists equipment and its use to best advantage in heavier excavations.

Shock Absorber Bulletin

The Ajax Flexible Coupling Company, Westfield, New York, has recently issued a new general bulletin, completely describing the *Ajax* industrial shock absorber. This book is complete with illustrations and data, and sets forth the advantages of the *Ajax* rubber bumper coupling.

Constructive Safety Publication

"Preventing Accidents in Mines and Quarries" is the subject of a recent issue of *"The Explosives Engineer,"* published by the *Hercules Powder Company, Inc.*, Wilmington, Delaware. The contents of this issue form a symposium of previous articles appearing in the publication having to do with various phases of safety. Copies may be had upon request.

Control Devices

Application of automatic control of temperature, pressure, fluid flow, machine speeds, liquid level and gaseous mixtures is shown in a multiple-fold leaflet published by the *Brown Instrument Company*, Philadelphia, Pennsylvania.

Catalog 87 deals with the subject more in detail.

Leakproof Valve Booklet

Merco Nordstrom plug valves, "that won't leak and won't stick," are described in a small pamphlet issued by the *Merco Nordstrom Valve Company*, whose agencies are in principal cities.

An interesting tabulation shows what valve leaks cost in wasted water, steam or air.

Controller Leaflet

A remote-indicating speed controller for alternating current, slip-ring induction motors, is described in a leaflet published by the *General Electric Company*, Schenectady, New York.

Conveyor Catalog

The Link-Belt Company, Chicago, Illinois, is distributing its *Data Book 615*, on the *Link-Belt belt conveyor.* It forms a handbook and contains some hitherto unpublished formulas.

G-E Governors

The General Electric Company has published a four-page loose-leaflet on air compressor governors. Description of operation, regulation of setting and range, and a sectional view are included.

NOTES FROM THE FIELD

Timken Purchases Complete Control

The Timken Roller Bearing Company of Canton, Ohio, and *Mr. M. B. U. Dewar* of London, England, have, together, purchased from *Vickers, Limited,* all of the capital stock of *British Timken, Limited.* This purchase gives *Timken* complete control, throughout the world, of the manufacture and sale of Timken bearings.

Mr. Dewar, who now assumes active management of *British Timken* affairs, was until recently Managing Director of the Metropolitan Carriage, Wagon & Finance Co., Limited, of Birmingham, England.

The Birmingham plant of *British Timken, Limited,* is being enlarged, and large quantities of new machinery and equipment have been installed. Officials are now at the Canton, Ohio, works making final arrangements for the immediate establishment of factories in France and Germany.

Bates International

The Bates Valve Bag Company has placed its foreign operations in the hands of the *Bates International Bag Company*, a corporation newly organized for this purpose.

The latter will operate under an agreement with the American company with respect to the sale and distribution of Bates products in foreign countries, exclusive of Canada.

Amsco Manufactory

The American Manganese Steel Company, Chicago Heights, Illinois, has purchased the iron foundry of the *American Brake Shoe and Foundry Company*, at Burnside, Chicago. This is seventh link in a chain of foundries nationally distributed that are producing Amsco manganese steel castings.

Safety Film

In connection with the campaign to reduce the number of accidents to children from playing with blasting caps, the *Institute of Makers of Explosives* has prepared a one-reel motion picture film entitled "How Jimmy Won the Game." This film shows forcefully and in a way which can be understood by the children the dangers of a blasting cap as a plaything.

Schools and safety meetings may secure copies by addressing C. Stewart Comeaux, Secretary, *Institute of Makers of Explosives*, 103 Park Avenue, New York City.

North American Contract

The North American Cement Corporation has awarded a contract to the *Edge Moor Iron Company*, for the equipping of its Security, Maryland, plant with *Edge Moor* waste heat boilers and auxiliary power plant equipment. The plant is to be ready for operation by July 1, 1928.

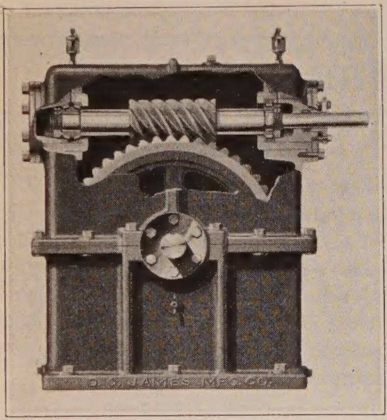
Mill Equipment

James Worm Gear Speed Reducer Ready

After passing exacting and comprehensive shop tests, the new James heavy duty worm gear speed reducer is now available. Worms and gears run on a special relieving machine to make certain of smooth, frictionless action.

It may be applied in most severe conditions, in cases where worm gear reducers have been impractical.

Overheating is prevented by a large oil cooling chamber. Sight feed oil cups are used for furnishing a high grade of oil to the roller bearings on the worm shafts when the worm is at the top of the unit. The oil level cock, fitted into the side of the housing, prevents over-oiling. Cleaning and draining of gear oil is facilitated by an oil drain plug in the lower part of the housing.



Roller bearings are of Timken and Norma-Hoffman make. Bushings are interchangeable. Phosphor bronze gears and S. A. E. 3140 chrome nickel steel worms are used. Housings are of high grade gray iron, with the greatest possible amount of cooling space and braced on the outside for strength.

Hill "Forged-Cast" Spur Gear

The Hill Clutch Machine and Foundry Company, Cleveland, Ohio, has originated and developed a gear known as "Forged Cast" which has forged steel teeth and a semi-steel hub. An annular forged ring in which is cast a hub with either web or arms comprises the construction. After being cast, the gear is finish machined and the teeth cut.

The junction of the steel rim and the semi-steel center is a steel and iron laminated weld, with the finished gear an integral piece.

New "S-A" Belt Conveyor Carrier

The Stephens-Adamson Manufacturing Company, Aurora, Ill., have recently placed on the market a new type of belt conveyor carrier which embodies several improvements in construction and design. The new carrier is known as the Stephens-Adamson Simplex Carrier, the complete line including carriers for belts ranging in width from 12 to 60 inches. The carrier proper consists of three rollers in line, the troughing rollers being mounted at a 20-degree angle in order to increase the capacity of the belt. The carriers are mounted on a heavy steel angle section base, which is self-cleaning. The whole assembly is tilted slightly in the direction of belt travel, in order to facilitate the proper training of the belt.

The rollers are self-contained units, of very simple, but strong construction. They are made of steel tubing, and are furnished with drawn steel end plates. The ends of the rollers are rounded to protect the belt from fraying, or wear. Each roller is equipped with two Timken Bearings, the method of mounting the bearings being as follows: The cones, or lower races, are pressed onto the roller shaft and located by a washer. The cups are pressed into a steel tube which forms the roller axle, and are located by shoulders in the tube. The bearings are protected from dust and other foreign substances by a combined labyrinth washer and multiple groove grease seal. The permanent adjustment of the bearings is provided for by lock screws.

Plymouth Locomotive Has Diesel Engine

What is believed to be the first Diesel-powered, gear-driven locomotive built in America has been brought out by the Plymouth Locomotive Works (the Fate-Root-Heath Company), Plymouth, Ohio. The engine consumes from 2½ to 3½ gallons of fuel oil per hour, depending on the class of service; and the consumption of lubricating oil is somewhat less than in a gasoline engine of equal power.

The power plant is a 4-cylinder, 4-cycle, enclosed type Atlas-Imperial Full Diesel engine 6½x8½ inches, developing 77 H. P. at a speed of 650 R. P. M. Starting is accomplished by compressed air, and a small combined gas engine and compressor is fitted in the cab for providing starting air. This unit is used for emergency only. The engine has built into it an air compressor that normally supplies all the air necessary for keeping the starting tanks filled.

The final drive from transmission to driving axles is by means of two short hardened steel roller chains. A heavy cast-steel frame forms the structure upon which the engine, transmission, cab, etc., are mounted. The side frame members also form the truck frame, having suitable provision for mounting the roller bearing axle boxes.

A Modine sectional radiator and a 30-inch, 8-bladed fan driven from the engine provide the necessary cooling.

Plymouth Diesel locomotives will be made in a full range of sizes from 10 ton up to 50 ton, and the larger ones will soon be in production.

General Electric Installs New Line of Motors

The General Electric Company, Schenectady, New York, has begun the manufacture and sale of a new line of motors for portable electric hoists, from 1 to 10 h.p. in direct-current types and from 1 to 11 h.p. A. C. The motors are totally enclosed; bearings are of the waste-packed, sleeve type.

To provide for brakes used in many applications, they are built with the shaft extension away from the drive, and the motor end-shield at that end is fitted with pads or bosses with drilled and tapped holes for mounting brakes.